

As many site factors will effect the transmission of vibration through the ground, the most accurate prediction of ground vibration from a site will be from vibration measurements taken on-site. However, in the absence of such site data, ground vibration levels have been estimated using the following formula:

$$V = K_g \left(\frac{R}{Q^{1/2}} \right)^{-B} \quad \text{Equation (3)}$$

Table 4-8 summarises the constants in Equation (3) and the values that have been assumed to estimate ground vibration levels in this assessment.

AS2187.2-2000 states that when blasting is carried out to a free face in average field conditions, the mean vector peak particle velocity may be estimated by assuming the values of K_g and B in Table 4-8.

Table 4-8 Ground Vibration Parametres and Assumptions

Parameter	Definition	Assumed Value
V	Ground vibration in vector peak particle velocity (vppv) (m/s)	N/A
R	Distance from charge (m)	Range: 200 to 1000 metres
Q	Maximum charge mass (kg)	100 ⁽¹⁾
K_g, B	Constants related to site and rock properties for estimation purposes	$K_g = 1140$ $B = 1.6$

(1) Charge mass has been calculated based on a hole diameter of 89 mm, column height of 13 metres and a charge mass of 7.5 kg/meter (specific gravity 1.2).

Figure 6 displays a graph of the estimated airblast overpressure and ground vibration levels against the distance from the blast.

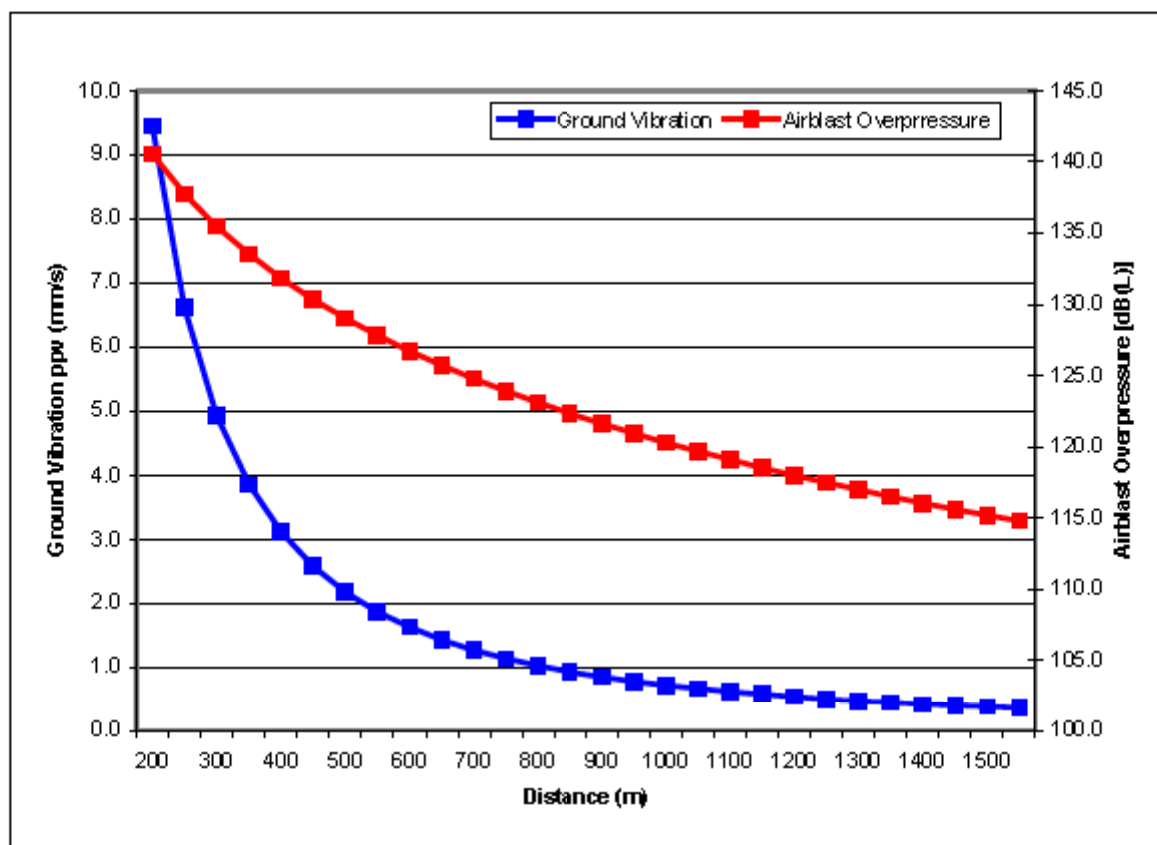


Figure 6 Airblast and Ground Vibration Predictions

Estimations of airblast overpressure indicates that the recommended peak noise level of 115 dB(L) may be reached at up to 1500 metres from the blast location. However, as attenuation loss from screening of local terrain features has not been taken into account, these estimations are considered to be conservative.

Estimations of ground vibration levels indicates that the 5 mm/sec recommended limit may be reached at up to 300 metres from the blast location.

4.4 Operational Noise Assessment

4.4.1 Industrial Noise

Industrial Noise

GHD understand that the sources of noise during the operation of the Proposal would be:

- ▶ Proposed borefields and associated pumping stations (headworks); and
- ▶ Maintenance and visitor traffic on Valla/ Bobo Roads.



Given the relative isolation of the proposed borefields and the limited number of traffic movements expected during the operation of the Proposal, operational noise modelling has focused on the predicted noise likely to be generated from the proposed headworks building.

For continuous operation of two pumps within the headworks building, predicted contribution based on modelling at the nearest residential boundary would be approximately 12 dB(A) under neutral conditions. Table 4-9 documents the results of the modelling whilst Figure 7 illustrates the proximity of the nearest residential dwelling to the existing and proposed headworks building.

Table 4-9 Predicted Noise Modelling

Source Partial Level Day				
Name	ID	Receiver 1	Receiver 2	Nearest Receiver
Louvre	Louvre	-14.3	-21.3	6.1
Pump house	Roof NE	-12.7	-16.8	4.5
Pump house	Roof SE	-12.5	-16.6	4.5
Pump house	NE Embankment	-16.9	-20.7	3.6
Pump house	SE Embankment	-20.4	-24.3	0
Pump house	SW Embankment	-21.4	-27.8	-2
Pump house	NW Embankment	-24.6	-33.2	-4.8
Roller door	Roll Door	-25.2	-34.9	-6.9
Door 40		-33.7	-43.6	-13.8



Figure 7 Operational Noise Assessment

The operational criteria for the Proposal would be 36dB for day & 35dB for evening & night and therefore 12dB would likely be inaudible. The main contributor to the increase in noise would be the proposed non-acoustic louvre (2m x 1m) on southern side of headworks building followed by the corrugated steel roof with insulation/sarking and then the proposed brick embankments of the building. The roller door (sheet steel) is a lower contributor due to its location on the southern side of the building.

4.4.2 Road Traffic Noise

Information regarding additional road traffic due to the proposed project was not available at the time of this assessment. However, it is expected that road traffic following the construction of the project would primarily occur during daytime hours and would not be of a significant volume. Therefore, it is not expected that road traffic noise from the proposed project will be an issue.



5. Recommendations

Some in-principle mitigation measures have been provided below to assist with noise and vibration control during the construction and operation phase of the proposed development.

The purpose of the below recommendations is to ensure that all feasible and reasonable measures enabling control and minimisation of site noise and vibration emissions are considered.

5.1 Construction Noise and Vibration

5.1.1 Work Ethics / Community Relations

- ▶ All site workers should be sensitised to the potential for noise impacts onto local residents and encouraged to take all practical and reasonable measures to minimise noise during the course of their activities; and
- ▶ The site manager (as appropriate) should establish contact with the local residents and communicate the construction program and progress on a regular basis, particularly when noisy activities are planned.

5.1.2 General Recommendations

As far as practicable, the following general noise control measures should be incorporated in the construction noise management plan:

- ▶ Aim to minimise movements of equipment and personnel during noise sensitive periods, such as nighttime; and
- ▶ Staff arriving or leaving the site before 7 am or after 6 pm should be aware of the potential for noise impacts at nearby receivers.

Due to the potential for construction noise goals to be exceeded GHD recommends that the following measures be taken into consideration during construction of all infrastructures associated with the project in order to reduce risk of noise impact:

- ▶ All work should be kept within the working hours prescribed by the DECC CNG. This includes trucks not arriving on site before 7:00 am. Should works out of these hours be needed, the work methods and noise goals of the DECC's CNG should be considered;
- ▶ Review available fixed and mobile equipment fleet and prefer more recent and silenced equipment whenever possible. In any case, all equipment used on site should be in good condition and good working order;
- ▶ Plan to use equipment, which is fit for the required tasks in terms of power requirements;
- ▶ All engine covers should be kept close while equipment is operating;
- ▶ As far as possible, materials dropping heights into or out of trucks should be minimised;



- ▶ All combustion engine plant, such as generators, compressors and welders should be checked to ensure they produce minimal noise with particular attention to residential grade exhaust silencers;
- ▶ Vehicles should be kept properly serviced and fitted with appropriate mufflers. The use of exhaust brakes should be eliminated, where practicable;
- ▶ Where practical, machines should be operated at low speed or power and should be switched off when not being used rather than left idling for prolonged periods;
- ▶ Machines found to produce excessive noise should be removed from the site or stood down until repairs or modifications can be made; and
- ▶ Should blasting be used on site, the activity should be subject to a vibration control plan, as it is generally the major source of vibration found on construction sites.

5.2 Operation Noise and Vibration

5.2.1 General Recommendations

As far as practicable, the following general noise control measures should be incorporated in the design of operational noise sources, such as pumping stations:

- ▶ All external noise sources should be located so as to avoid direct line of sight with noise receivers;
- ▶ If possible, ventilation or exhaust openings should not face noise receivers;
- ▶ Staff arriving or leaving the site for maintenance before 7 am or after 6 pm should be aware of the potential for noise impact at nearby receivers.

5.2.2 Mechanical Plant – General Advice

- ▶ Investigate the operational requirements for the mechanical systems and where practical, optimise the required operational time with consideration to potentially noise sensitive time periods, such as night;
- ▶ Equipment should be kept properly serviced;
- ▶ Where practical, machines should be operated at low speed or power and should be switched off when not being used rather than left idling for prolonged periods;
- ▶ Mechanical plant should be fully enclosed to minimise noise propagation; and
- ▶ All equipment should be vibration isolated, with consideration to manufacturers requirements.



6. Conclusions

GHD was commissioned by Nambucca Shire Council (NSC) to undertake a noise and vibration impact assessment as part of an EIS for the proposed construction and operation of the Bowraville Off-River Storage Works.

The aim of this noise and vibration assessment has been to assess the level of impact from the construction and operation of the proposed project on the surrounding environment. Due to the nature of the proposed project, noise and vibration impacts during construction have the greatest potential for impact and is therefore the focus of this assessment.

Assuming construction activities will primarily be undertaken between 7 am and 6 pm Monday to Friday, and 7 am to 1 pm Saturdays, construction noise impacts may exceed the 41 dB(A) construction noise goal at nearby residential receivers based on the conservative estimates made in this assessment.

Noise from the proposed pipeline construction has the greatest potential for impact due to the proximity of noise receivers to construction activity. However, given the mobile nature of construction activities, it is expected that noise receivers will only be exposed to elevated noise levels for relatively short periods.

GHD believe that with the general type of construction operations and the typical separation distance to nearby receivers, vibration impacts from general construction activity should be negligible. However, blasting, if it occurs is expected to generate the most significant vibrations levels and may cause vibration impacts at nearby receivers.

Estimations of airblast overpressure indicates that the recommended peak noise level of 115 dB(L) may be reached at up to 1500 metres from the blast location. Estimations of ground vibration levels indicates that the 5 mm/sec recommended limit may be reached at up to 300 metres from the blast location. As attenuation loss from screening of local terrain features has not been taken into account, these estimations are considered to be conservative.

Detailed assessments of noise impacts during the operations of the proposed project have not been undertaken at this stage; however, noise impacts are not expected to be significant.

Recommendations for noise mitigation measures have been provided in Section 5 of this report.

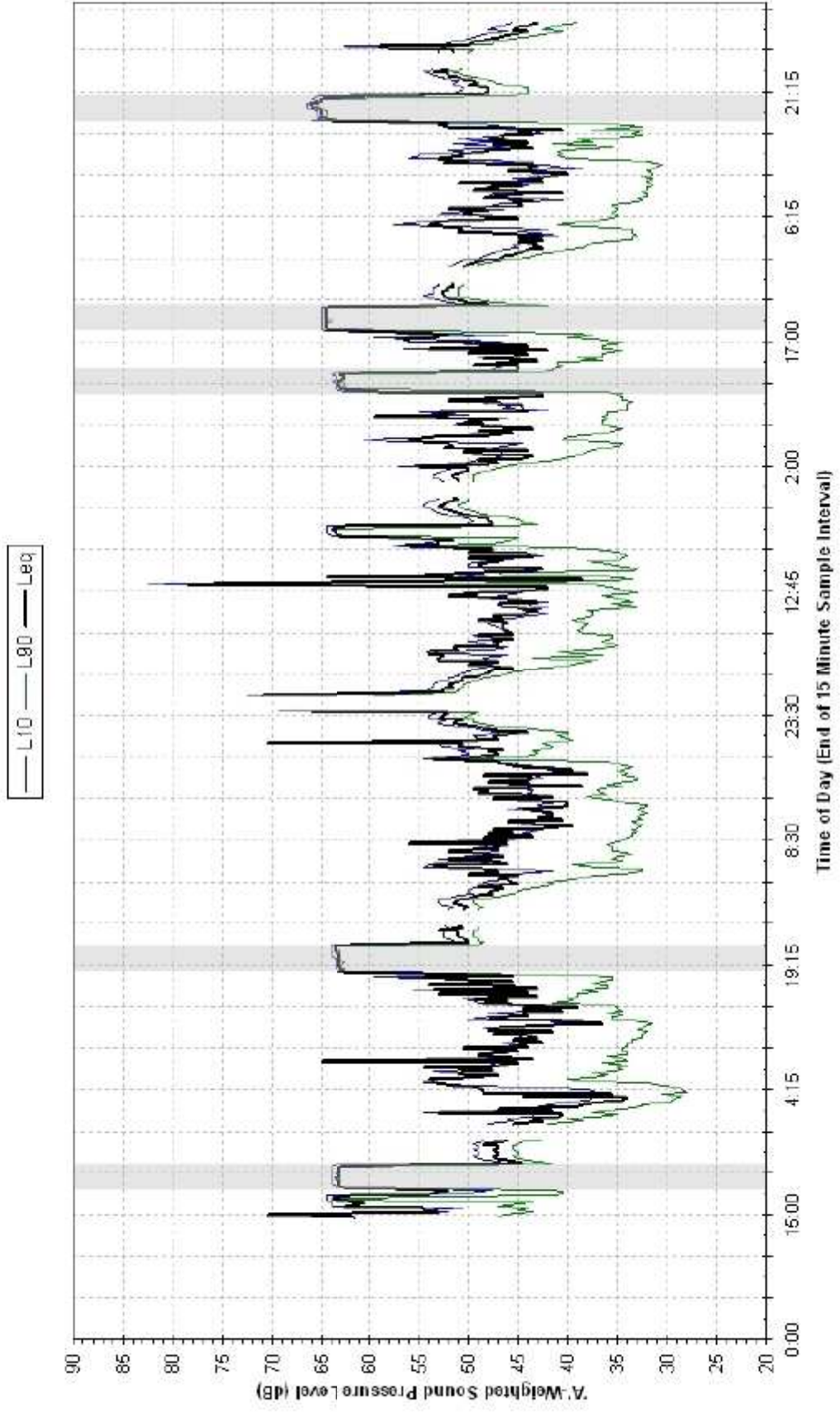


Appendix A

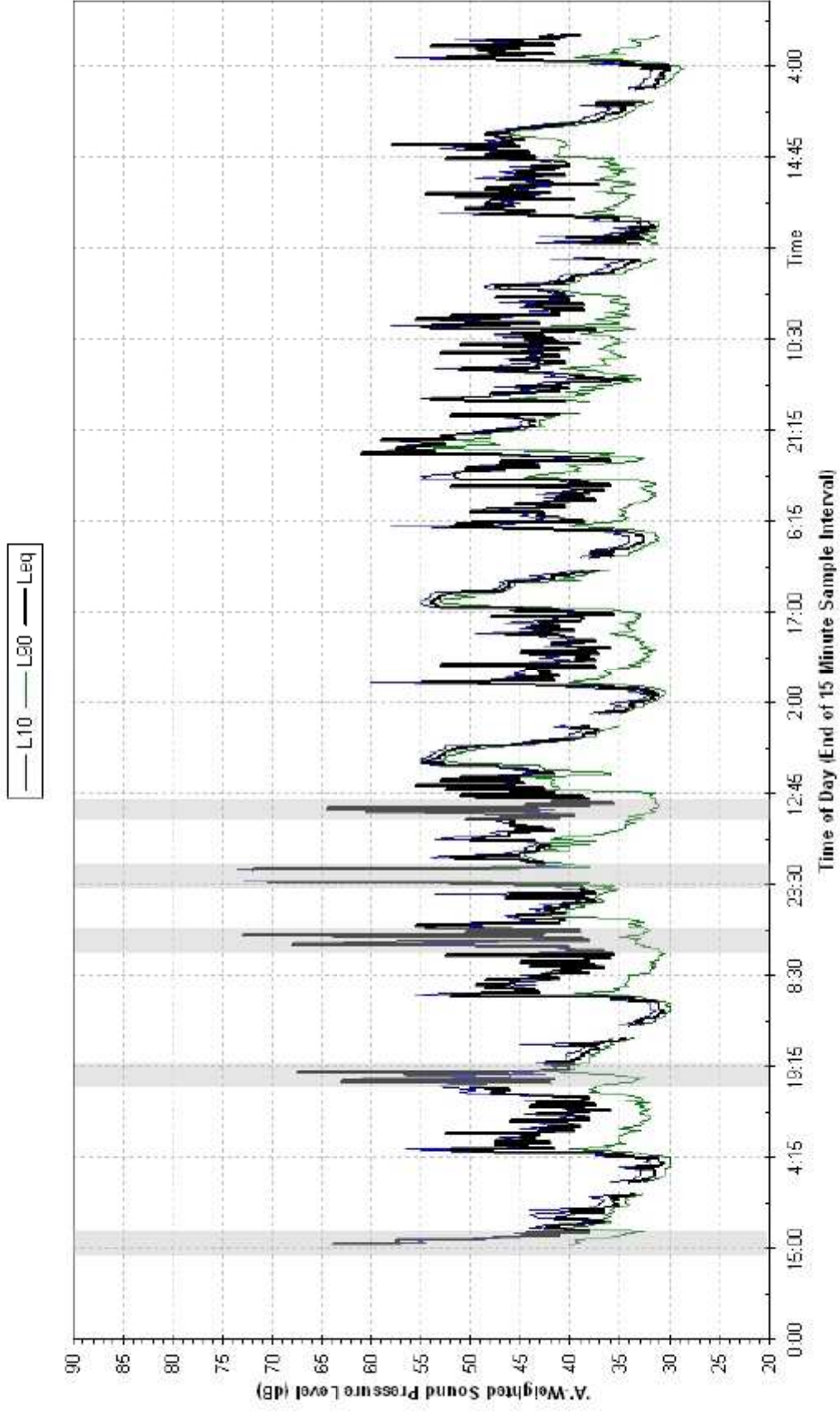
Noise Monitoring Results

Statistical Noise Data

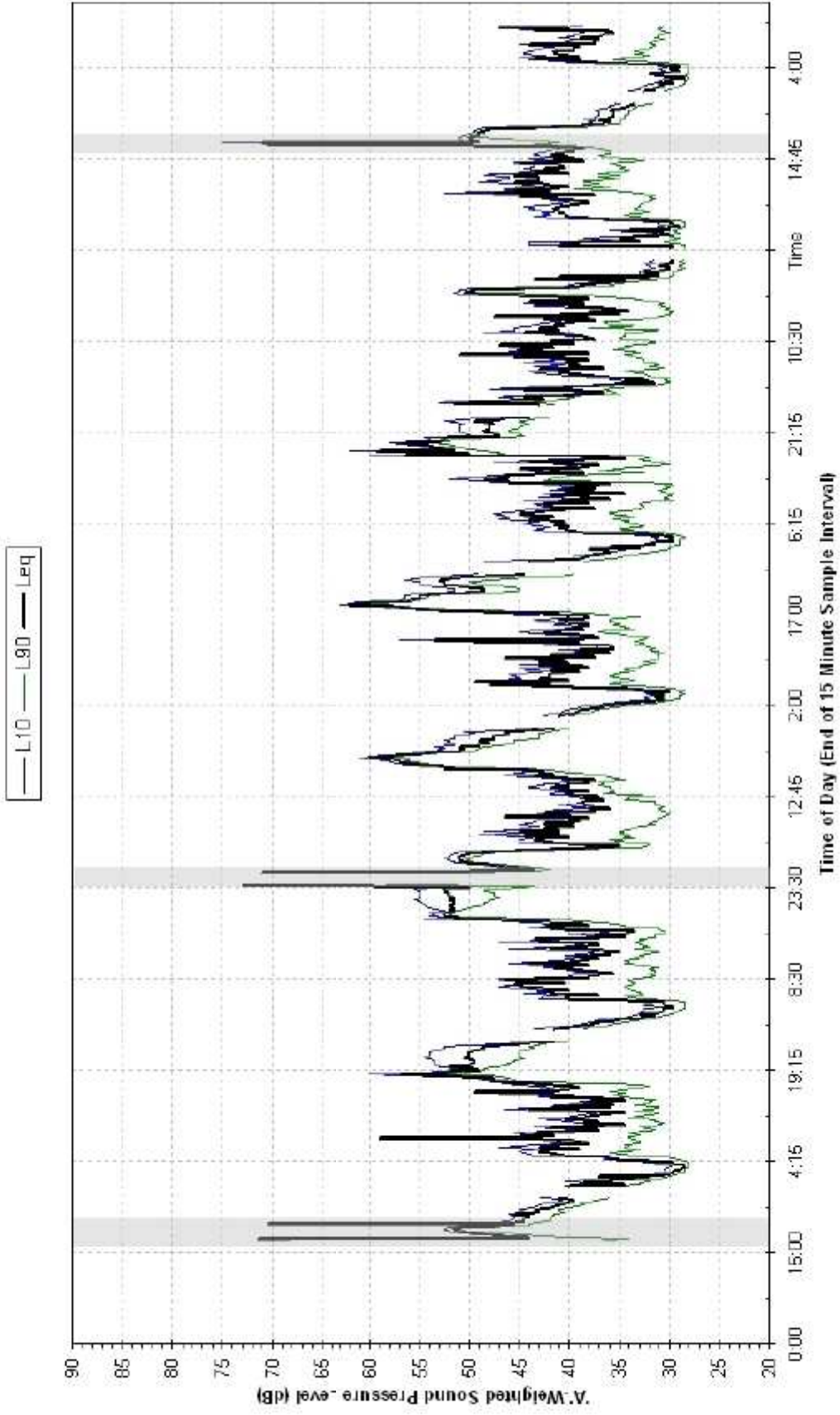
Statistical Ambient Noise Levels Logger 1 - 18/09/08 to 24/09/08



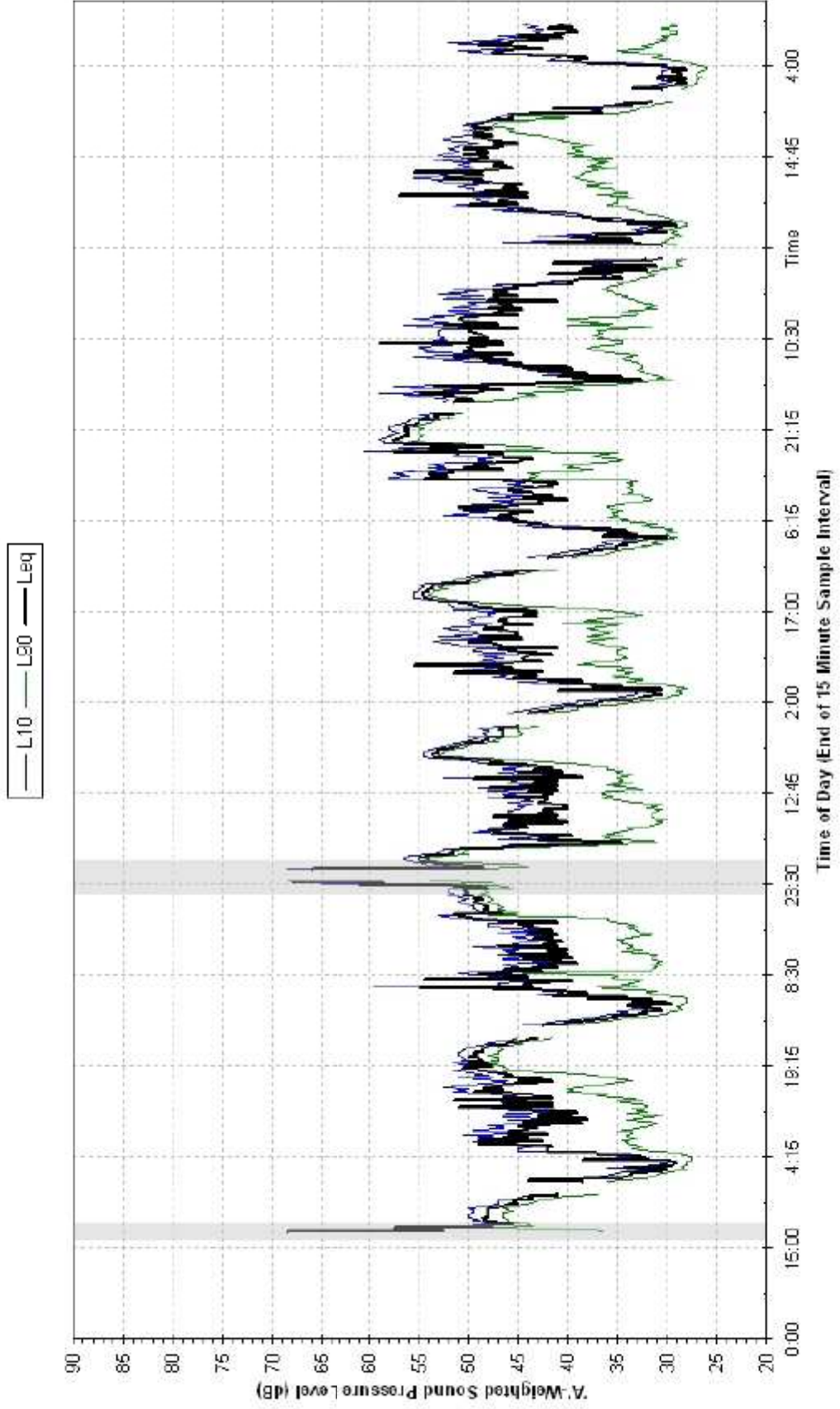
Statistical Ambient Noise Levels
Logger 2 - 18/09/08 to 26/09/08



**Statistical Ambient Noise Levels
Logger 3 - 18/09/08 to 26/09/08**



Statistical Ambient Noise Levels
Logger 4 - 18/09/08 to 26/09/08





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This report should not be altered, amended or abbreviated, issued in part or issued incomplete in any way without prior checking and approval by GHD.

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	T Gribble	V Chavand	<i>V Chavand</i>	G Collins	<i>G Collins</i>	29/01/09



Appendix E

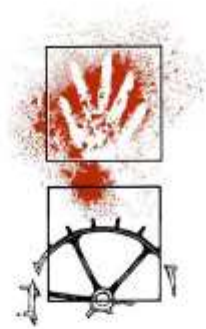
Cultural Heritage Report



Nambucca District Water Supply Environmental Impact Assessment

Cultural Heritage Assessment of Ancillary Areas

February 2009



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A Report to GHD

EXECUTIVE SUMMARY

This report documents the results of an archaeological study undertaken of ancillary works relating to the Nambucca Water Supply project, including assessment of an access route, five pipeline route options and five bore field options. The report incorporates relevant information from previous Nambucca Water Supply heritage studies

The main objectives of the Nambucca Water Supply Scheme Upgrade project are to enhance the security of supply by upgrading the headwork, to add headwork capacity to meet future population growth and demand, to comply with the Water Management Act by explicitly allowing for the maintenance of environmental flows in Nambucca River past the extraction zone, and to ensure the quality of the stored water is managed to current best practice standards.

The Nambucca District Water Supply Project study area is located within the boundaries and area of custodial interest of the Bowraville Local Aboriginal Land Council. An *Aboriginal Liaison Committee* has been set up to facilitate and encourage participation of the local community in the design and construction of the Nambucca District Water Supply Project. To date five Aboriginal Liaison Committee meetings have been held. A representative of the BLALC, community elder, Mr Kevin Ballangarry, participated in the field surveys of the ancillary areas.

The results of cultural heritage studies conducted for the Nambucca District Water Supply Project are as follows:

- One possible Aboriginal object (a manuport, NSW1) was recorded in 2004. The manuport is located 50 m from dam sub-option 2b impoundment maximum storage level.
- One area of potential Archaeological Deposit, NWSPAD1, was recorded in the course of the 2008 field survey. The PAD is located in the section of Bowra Creek flats and basal slopes traversed by proposed pipeline routes 1, 3, 4 and 5.
- Two areas of Aboriginal cultural value, the burial ground [the rocks] and a corroboree area, and a mythological site, was identified by Aboriginal informants. The Rocks is located on the Nambucca River and a buffer zone of 30 m either side of the river has been identified by Aboriginal representatives. The mythological site is located on South Creek (both of these areas may be impacted by new boreholes).
- Two European heritage items, a forestry tree stump with springboard holes and the remains of a charcoal kiln, were recorded in 2004. The forestry tree stump (NWSH1) is located within the dam impoundment area. The charcoal kiln (NWSH2) is located to the west (and outside of) the dam impoundment area.
- No European heritage sites were located in the context of the 2008 field survey.

It is recommended that:

- No further archaeological survey is required for the Nambucca Water Supply Project dam and ancillary areas.
- The possible Aboriginal manuport NWS1 should be collected prior to any potential impact and should be curated by the local Aboriginal community. Alternatively, this item could be re-positioned near to its find location but outside of any impact zones. A section 87 permit (and a Care and Control Agreement for the collection option) would be required from the DECC to conduct these actions.
- If NWPAD1 is to be impacted by the installation of pipelines then a program of archaeological subsurface investigation should be undertaken with the aim of determining the nature, extent and significance of any subsurface archaeological deposit present within the area.

- Impact to the identified burial ground and corroboree ground [the rocks] and the identified mythological site should be avoided. Advice should be sought through the project Aboriginal Liaison Committee as to appropriate avoidance strategies and buffer zones for these areas.

A buffer zone of 30 m either side of the river has been identified by Aboriginal representatives for The Rocks area and this strategy should be discussed further by the Aboriginal Liaison Committee.

- To minimise potential delays in construction resulting from the identification of unidentified Aboriginal sites it is proposed that after initial vegetation clearance Aboriginal representatives and archaeologists should undertake an inspection of the inundation area. This would provide an opportunity to locate and collect any sites that may not have been able to be seen during the surveys. As87 will be required to do this.
- Copies of this report should be provided to the Bowraville Local Aboriginal Land Council and the project Aboriginal Liaison Committee with an invitation to discuss and comment on its findings, provide assessments of the Aboriginal cultural values of the sites and areas described in the report, and provide input to the management strategies suggested in the report.
- Notification of the intention to impact the forestry stump, site NWSH1, should be provided in writing to the Director of the NSW Heritage Office with a request that a determination be made as to whether the intended impact falls under an existing exemption to section 139 permit provisions. No impact can occur until this advice is received and acted upon. This procedure is necessary because this site falls under the definition of a relic (as defined by the *Heritage Act 1977*), but has not been assessed as having local or a greater level of significance.

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1. INTRODUCTION

1.1 Project History

In 1994 Sinclair Knight Merz prepared a strategy study for the Nambucca District Water Supply on behalf of the NSW Department of Public Works and Services and Nambucca Shire Council. It identified various potential water supply options for the towns of Bowraville, Macksville, Nambucca Heads, Scotts Head and Valla Beach, and some rural areas on the mid north coast of NSW.

The current water supply is drawn from a borefield in an alluvial aquifer interconnected with river levels in the Nambucca River. The formulation of an alternative water supply, storage and demand management results from limitations on the capacity of the aquifer, increasing demand, and the need to address future environmental flow requirements in the Nambucca River. The need for an off-river water storage site was reinforced by a Value Management Study (VMS) (DPWS 1995).

The VMS and scheme costings and appraisal (DPWS 1996) resulted in a short list of two possible dam sites (2a and 2b). These two sites were subject to preliminary investigations in the mid-1990s, including an archaeological assessment of dam site '2', which included both Options 2a and 2b (Gorman 1996).

Subsequently, dam sub-option site 2b was identified as the preferred dam site. This option is located two kilometres north of Bowraville.

In 2005 Navin Officer Heritage Consultants (NOHC) conducted a cultural heritage assessment of storage dam Site 2B and some ancillary works areas, and in October 2008, NOHC undertook a desktop review and update of previous cultural heritage assessments undertaken for the Nambucca District Water Supply project. The review defined the further works necessary to meet statutory and policy requirements in relation to the project.

This report documents the results of an archaeological study undertaken of ancillary works relating to the Nambucca Water Supply project, including assessment of an access route, five pipeline route options and five bore field options. (Figure 1.1). The report incorporates relevant information from previous Nambucca Water Supply heritage studies.

The report was commissioned by GHD on behalf of Nambucca Shire Council.

1.2 The Proposed Works

The main objectives of the Nambucca Water Supply Scheme Upgrade project are to:

- Enhance the security of supply by upgrading the headwork - the supply came close to failure during the extended dry period of 2002/03;
- Adding headwork capacity to meet future population growth and demand - these are long life assets with a significant lead time and hence the headwork is being sized for a projected population and demand of 20,000 people and 3,500ML/a respectively;
- Comply with the Water Management Act by explicitly allowing for the maintenance of environmental flows in Nambucca River past the extraction zone. In keeping with the adaptive management principles, Council is taking the leadership role; and
- Ensure the quality of the stored water is managed to current best practice standards – to reduce the likelihood of the need for a new water filtration plant.

The project involves expanding the borefield along Nambucca River and South Creek to accommodate up to 20 additional bores delivering up to 40ML/d of additional water to an off-river storage (ORS) located on the headwaters of Bowra Creek for use during low river flow periods.



Nambucca Shire Council proposes to:

- (a) expand the borefield along the Nambucca River and South Creek to accommodate an additional 20 bores and to expand field capacity by an additional 40ML/day, with interconnection with existing borefield to allow flexibility in pumping sources;
- (b) construct a new collection tank for the additional water to be sent up to the storage facility;
- (c) construct a new 40ML/day high lift pumping station near the existing borefield collection tank to transfer water to the storage;
- (d) construct approximately 1,500 to 2,000 m of nom. 750mm pipeline to connect the collection tanks to the proposed off-river storage;
- (e) construct an off-river storage on the head waters of Bowra Creek with an initial capacity of 5,500 ML but with the provision for foundations to provide for up to 14,000 ML capacity;
- (f) clear approximately 75 ha of land for the 5,500ML storage inundation area. Further clearing may be required for ancillary works (e.g. roads, pipelines). The inundation area is presently owned by the NSW Department of Primary Industries (DPI) and is part of sustainable forestry operations. Some of the 75 ha of clearing will be undertaken by DPI (Forests). Any clearing undertaken by DPI (Forests) is covered by existing approvals and is a separate activity from the water supply project;
- (g) install access roads to the storage and related infrastructure works;
- (h) install an aeration, mixing and/or destratification system in the off-river storage to control stored water quality;
- (i) construct a nom. 15ML/day booster pumping station near the storage embankment to supply water back to the headworks for distribution, with provision for expansion to 25ML/day;
- (j) investigate decommissioning and removal of the existing river crossing and replacement with an underground crossing and improving fish passage;
- (k) provide power to the relevant facilities;
- (l) extend the existing telemetry system to accommodate the new facilities and modify the existing control program;
- (m) make provision at the existing collection tank site for the construction of a 15ML/day water filtration plant to storage water if this proves necessary in the future. Include provision for possible future expansion to 25ML/day.

1.3 Report Outline

This report:

- Documents consultation conducted with the local Aboriginal community in the course of the study;
- Describes the study methodology;
- Describes the environmental setting of the study area;
- Reviews literature relevant to both European and Aboriginal occupation of the study area and incorporates data from previous cultural heritage studies as necessary;
- Describes the results of the study and;
- Provides management recommendations based on the results of the investigation. \



2. ABORIGINAL CONSULTATION

The Nambucca District Water Supply Project study area is located within the boundaries and area of custodial interest of the Bowraville Local Aboriginal Land Council (BLALC).

Gorman (2004) consulted with local Aboriginal community and documented information that was told to her by members of the Aboriginal community.

Consultation conducted in the context of the 2004 heritage study included initial phone contact with Ms Carol Maher of the Nambucca Shire Council Aboriginal Community Advisory Committee. The BLALC was then contacted by phone and fax and the project was discussed with BLALC co-ordinator, Mr Brian Flanders.

Mr Flanders organised for a male and female Sites Officer to participate in the field surveys for the Water Supply project. Subsequently Mr Fred Walker and Ms Dianne Jarrett joined the archaeologists in the field in November, 2004.

An informal meeting was held at the Bowraville LALC office in Bowraville on November 8, 2004, to discuss the project and the survey results. In attendance were Kerry Navin and Kelvin Officer (archaeologists) and the following local community representatives:

- Martin Ballangarry (Councilor with Nambucca Council)
- Wayne Buchanan (representing his father, community elder Mr Warren Buchanan)
- Brian Flanders (BLALC)
- Darrell Flanders (BLALC)
- Diana Jarrett (BLALC)
- Larry Kelly (Nambucca LALC)
- Fred Walker (BLALC)
- Bernadette Wilkes (community elder)

The representatives were invited to provide the consultants with any information that they believed was pertinent to the project, particularly the identification of any areas or landscape features that may be of significance to the local community. Issues that were raised at the meeting are summarised below.

- There was general consensus that the proposed dam needs to go ahead in partnership with the local Aboriginal community. This included:
 - establishing protocols with the community regarding consultation about the project;
 - possible employment opportunities for local community people, particularly young men – this is considered to be an important goal for the community;
 - monitoring of ground surface disturbance from start to finish (from day 1 to the end) because there have been problems in the past where subcontractors have damaged sites without knowledgeable people being present;
 - consideration of using an Aboriginal name for the lake which will be impounded behind the dam;
 - concerns for river safety - children use the river and therefore pump stations (and other works near the river) must be safe;
 - an area referred to as 'The Rocks' burial ground near the Nambucca River was identified as being of particular importance to the local community.



- At a broader level there was:
 - general concern for the health of the Nambucca River – locals have noticed changes to the river over time, including the presence of more gravels in the river bed;
 - discussion about the need for a council-wide Heritage Study;
 - agreement that the Gumbaingirri people need to get their heritage sites recorded and protected within the tribal area, not just in Shire Council areas;
 - general concern for the protection of Aboriginal cultural heritage sites, with comment that there were still many Aboriginal sites that remained unrecorded and/or unprotected in the Shire;
 - a comment that spear fishing is still very important up and down the Nambucca River; and
 - information that some elders came from the Yellow Rock area to the Bowra area.

The representatives were also asked to consider and discuss the water supply project amongst the wider community for a few weeks and to provide the consultants with any relevant feedback.

BLALC co-ordinator, Brian Flanders, was contacted five weeks later. Brian indicated that the project had been tabled at a BLALC meeting by Mr Fred Walker (one of the sites officers who participated in the field survey). The community discussed the project and indicated that they had no major concerns with the project.

An *Aboriginal Liaison Committee (ALC)* was set up in 2007 by the NSW Department of Commerce to facilitate and encourage participation of the local community in the design and construction of the Nambucca District Water Supply Project. To date five meetings have been held, the minutes of meetings 1, 2, 4 and 5 are included in Appendix 1. (Navin Officer Heritage Consultants has not been party to these meetings).

In December 2007, Nambucca Council and the Department of Commerce conducted a 'walk-through' of the Nambucca Borefields areas with Aboriginal community elders. This walk-through identified and mapped three areas of significance to the local Aboriginal community in the borefields investigation areas (pers comm Tim Alexander [Dept of Commerce] 2008).

A mythological site was identified by the representatives during the walkover and a previously identified burial ground was also identified as a corroboree area. A record of the walkthrough, its findings and a map of identified places is included in Appendix 2.

The BLALC was contacted in relation to the current survey and a representative was invited to participate in the fieldwork. Community elder, Mr Kevin Ballangarry, subsequently joined the archaeologists in the field survey. A *Record of Field Participation* is included in Appendix 3.



3. STUDY METHODOLOGY

3.1 Database and Literature Review

A range archaeological and historical data was reviewed for the Nambucca study area and its surrounds in the context of the NOHC 2004/2005 study. This literature and data review was used to determine if known Aboriginal and historical sites were located within the area under investigation, to facilitate site prediction on the basis of known regional and local site patterns, and to place the area within an archaeological and heritage management context.

Aboriginal literature sources included the (then) NSW Department of Environment and Conservation (DEC) Aboriginal Heritage Information Management System (AHIMS), associated files and catalogue of archaeological reports, and the (draft) Nambucca Shire Council Aboriginal Cultural Heritage Management Plan.

Sources of historic information included the heritage listings of the Australian Heritage Commission, the NSW Heritage Council sites register (Inventory and Register) and the National Trust Register.

This data was updated for the current (2008) studies.

3.2 Fieldwork

Fieldwork was undertaken in December 2008. Field survey was undertaken (on foot) of the access road corridor, five pipeline options and five borefield location options. In areas of very poor ground surface visibility the general vicinity was viewed and an assessment of archaeological sensitivity was made for the area.

3.3 Project Personnel

Archaeologists Nicola Hayes and Deirdre Lewis-Cook conducted the field survey, accompanied by Mr Kevin Ballangarry of the BLALC.

3.4 Recording Parameters

3.4.1 Aboriginal Sites and PADs

The archaeological survey aimed at identifying material evidence of Aboriginal occupation as revealed by surface artefacts and areas of archaeological potential unassociated with surface artefacts. Potential recordings fall into two broad categories: sites and potential archaeological deposits.

Sites

A site is defined as any material evidence of past Aboriginal activity that remains within a context or place which can be reliably related to that activity.

Most Aboriginal sites are identified by the presence of three main categories of artefacts: stone or shell artefacts situated on or in a sedimentary matrix, marks located on or in rock surfaces, and scars on trees.

Frequently encountered site types within southeastern Australia include stone artefact occurrences - including isolated finds and open artefact scatters, coastal and freshwater middens, rock shelter sites - including occupation deposit and/or rock art, grinding groove sites and scarred trees. For the purposes of this section, only the methodologies used in basic site identification are outlined, together with those for the recording types encountered by this investigation.



Isolated finds

An isolated find is a single stone artefact, not located within a rock shelter, and which occurs without any associated evidence of Aboriginal occupation within a radius of 60 metres. Isolated finds may be indicative of random loss or deliberate discard of a single artefact, the remnant of a now dispersed and disturbed artefact scatter; and/or an otherwise obscured or subsurface artefact scatter.

Except in the case of the latter, isolated finds may be considered to be constituent components of the *background scatter* present within any particular landform.

The distance used to define an isolated artefact varies according to the survey objectives, the incidence of ground surface exposure, the extent of ground surface disturbance, and estimates of *background scatter* or *background discard* densities. In the absence of baseline information relating to background scatter densities, the defining distance for an isolated find must be based on methodological and visibility considerations. Given the varied incidence of ground surface exposure and deposit disturbance within the study area, and the lack of background baseline data, the specification of 60 metres is considered to be an effective parameter for surface survey methodologies. This distance provides a balance between detecting fine scale patterns of Aboriginal occupation and avoiding environmental biases caused by ground disturbance or high ground surface exposure rates. The 60 metre parameter has provided an effective separation of low density artefact occurrences in similar southeast Australian topographies outside of semi-arid landscapes.

Background scatter

Background scatter is a term used generally by archaeologists to refer to artefacts which cannot be usefully related to a place or focus of past activity (except for the net accumulation of single artefact losses).

There is no single concept for background discard or 'scatter', and therefore no agreed definition. The definitions in current use are based on the postulated nature of prehistoric activity, and often they are phrased in general terms and do not include quantitative criteria. Commonly agreed is that background discard occurs in the absence of 'focused' activity involving the production or discard of stone artefacts in a particular location. An example of unfocused activity is occasional isolated discard of artefacts during travel along a route or pathway. Examples of 'focused activity' are camping, knapping and heat-treating stone, cooking in a hearth, and processing food with stone tools. In practical terms, over a period of thousands of years an accumulation of 'unfocused' discard may result in an archaeological concentration that may be identified as a 'site'. Definitions of background discard comprising only qualitative criteria do not specify the numbers (numerical flux) or 'density' of artefacts required to discriminate site areas from background discard.

Potential Archaeological Deposits

A potential archaeological deposit, or PAD, is defined as any location where the potential for subsurface archaeological material is considered to be moderate or high, relative to the surrounding study area landscape. The potential for subsurface material to be present is assessed using criteria developed from the results of previous surveys and excavations relevant to the region. Where necessary, PADs can be given an indicative rating of their 'archaeological potential' based on a combined assessment of their potential to contain artefacts, and the potential archaeological value of the deposit. Table 3.1 illustrates the matrix on which this assessment is based. Locations with low potential for artefacts fall below the threshold of classification. In such cases the potential incidence of artefactual material is considered to be the same as, or close to that for background scatter. Where there is moderate potential for artefacts, the predicted archaeological potential parallels the potential significance of the deposit. For deposits with high potential for artefacts, the assessed archaeological potential is weighted positively.

The boundaries of PADs are generally defined by the extent of particular micro-landforms known to have high correlations with archaeological material. A PAD may or may not be associated with surface artefacts. In the absence of artefacts, a location with potential will be recorded as a PAD. Where one or more surface artefacts occur on a sedimentary deposit, a PAD may also be identified



where there is insufficient evidence to assess the nature and content of the underlying deposit. This situation is due mostly to poor ground surface visibility.

Table 3.1 Matrix showing the basis for assessing the archaeological potential (shown in bolded black text) of a potential archaeological deposit

		Potential to contain Aboriginal objects		
		<i>Low</i>	<i>Moderate</i>	<i>High</i>
Potential archaeological significance	<i>Low</i>	---	low	moderate
	<i>Moderate</i>	---	moderate	high
	<i>High</i>	---	high	high

3.4.2 Historical Sites and Features

Historical archaeology refers to the 'post-contact' period and includes: domestic, commercial and industrial sites as well as most maritime sites. It is the study of the past using physical evidence in conjunction with historical sources. The two primary types of places or items that may form part of the terrestrial historical archaeology context include:

1. Below ground evidence, including building foundations, occupation deposits, features and artefacts; and above ground evidence, including buildings, works, industrial structures and relics that are intact or ruined; and
2. Areas of land that display evidence of human activity or occupation.

Within these broad parameters, an historical archaeological site may include:

- Topographical features and evidence of past environments;
- Evidence of site formation, evolution, redundancy and abandonment (that is, features and materials associated with land reclamation, sequences of structural development, demolition/deconstruction, and renewal);
- Evidence of function and activities according to historical theme/s represented (for example, an industrial site may contain diagnostic evidence of process, products and by-products);
- Evidence associated with domestic occupation including household items and consumables, ornaments, personal effects and toys;
- Evidence of diet including animal and fish bones, and plant residues;
- Evidence of pastimes and occupations including tools of trade and the often fragmentary signatures of these activities and processes;
- Methods of waste disposal and sanitation, including the waste itself which may contain discarded elements from all classes of artefact as well as indicators of diet and pathology; and
- Any surviving physical evidence of the interplay between site environment and people.

The information found in historical archaeological sites is often part of a bigger picture which offers opportunities to compare and contrast results between sites. The most common comparisons are made at the local level, however, due to advances in research and the increasing sophistication and standardisation of methods of data collection, the capacity for wider reference (nationally and, occasionally, internationally) exists and places added emphasis on identification and conservation of historical archaeological resources.



4. ENVIRONMENTAL CONTEXT

The Nambucca District Water Supply project study area is located in the Nambucca Shire on the NSW mid north coast near the small village of Bowraville. Bowraville is situated at the tidal limit of the northern arm of the Nambucca River. Prior to an increase in sediment load in the twentieth century, the river was deep enough to allow commercial boating up to the Bowraville wharf. In this section of the valley, the river meanders across a narrow alluvial valley floor that is intersected by low spurlines that merge inland into extensive low coastal rangelands.

The proposed dam site is located in a small upper catchment valley within fringing ranges on the northern margin of the Nambucca River. The wall of the preferred dam site, Site 2b, is situated two kilometres north of the town of Bowraville and 1.5 km northeast of the Nambucca River. The proposed dam would inundate the upper catchment of Bowra Creek, a small southwest draining tributary of the Nambucca River, with a total catchment of around eight square kilometres.

The northern watershed of the Nambucca River valley occurs along a ridgeline just 250 m northeast of the proposed reservoir. This ridgeline is approximately 100 m AHD behind the dam site, and rises towards the north to 466 m at Mount Viewmont. To the east is the coastal catchment of Deep Creek, and to the north, the catchment of the Kalang River.

The proposed access road will use an already formed and gravelled road to the east of Bowra Creek and the Dam inundation area. The road follows the forested crest of a ridgeline that marks the southern catchment for the proposed reservoir and extends westward from the main Nambucca River watershed (Figure 4.1). Below the ridgeline the road traverses cleared spurline crests to its intersection with Rodeo Drive.

The topography of the lower inundation area and the pipeline route options consists of an open valley of cleared undulating agricultural land with a narrow fluvial corridor and low intersecting spurlines.

Route options 1, 3, 4 and 5 follow Bowra Creek before turning and crossing Bellingen Road and traversing the major river terrace of the Nambucca River. Route option 2 utilises Bellingen Road and a property driveway before crossing Bowra Creek and joining with the other options to the Dam location. The mouth of Bowra Creek is situated at the tidal limit of the river. Bowra Creek is considered to be a permanent stream but is known to have occasionally run dry (Gorman 1996).

The banks of the Nambucca River are typically steep-sided and consist of sandy alluvial sediments. A narrow flood plain extends to varying widths on either side of the meandering riverbed. All of the borehole locations are within this flood plain.

The study area occurs within the Nambucca Slate Belt, an extensive area of metamorphosed sediments extending between Sawtell and South West Rocks, and over 100 km inland. The underlying bedrock of this belt is Lower Permian in age and consists of slate, phyllite, and schistose sandstone and conglomerates (Dorrigo – Coffs Harbour SH 56-10 & 11, 1:250,000 Geological Map 1st Ed 1971).



5. CULTURAL HERITAGE CONTEXT

5.1 Regional Context

Tribal and linguistic boundaries, traditional lifestyles, the impact of European settlement, a regional overview and a summary of previous archaeological research in the Nambucca area have been provided in the 2005 report by NOHC *Nambucca District Water Supply Storage Dam Site 2B and Ancillary Works Areas Cultural Heritage Assessment* (pp 12-14). The reader is referred to this document for background contextual information.

5.2 Previous Nambucca District Water Supply Studies

Gorman (1996) undertook a cultural heritage assessment of dam site '2', which included both Options 2a and 2b. No Aboriginal archaeological sites were identified in the course of Gorman's study.

Gorman provided an extensive review of Gumbaingirri ethnohistoric information and some general information on local family affiliations. Gorman also documented information about 'dangerous, mythological and a possible ancestral camping place' (Gorman 1996:34) that was told to her by members of the Aboriginal community.

Gorman conducted an historic heritage assessment of Site 2 (Options 2a and 2b) as part of her archaeological assessment. Her study included consultation with local landowners, review of information held at the Eliza and Joseph Newman Folk Museum in Bowraville and some field survey. Gorman was shown the site of a charcoal kiln by landowner, Mr Ussher.

More rigorous requirements for reporting archaeological assessments were implemented subsequent to Gorman's 1996 assessment (refer NPWS Standards and Guidelines 1997; correspondence: Liam Dagg to NSW Department of Commerce, 13 August 2004). Taking account of this factor, the Department of Commerce commissioned a review and update of the 1996 archaeology study to meet current requirements.

This review was conducted in 2004 by Navin Officer Heritage Consultants and included a review of relevant heritage literature and databases, Aboriginal consultation and field inspections. The scope of the field inspections was defined in part by property access information and the available plans for the Water Supply Project, and thus concentrated on the proposed dam site 2b inundation area, the dam wall area and access roads. Areas such as the pipeline routes, the pump site and release point on the Nambucca River, and Bowra Creek downstream to the dam were not subject to archaeological survey. These areas were viewed from nearby vantage points and an assessment made of their archaeological sensitivity/potential.

Field survey involved the field team walking most roads and forestry tracks in the inundation area, inspecting the dam wall area and walking the proposed access road. The Bowra Creek riparian zone was surveyed upstream of the dam wall for approximately 750 m. Survey in the thickly vegetated upper reaches of Bowra Creek was opportunistic and limited to areas that were accessible.

In October 2008, NOHC undertook a desktop review and update of previous cultural heritage assessments undertaken for the Nambucca District Water Supply project. The review defined the further works necessary to meet statutory and policy requirements in relation to the project.

5.3 Sites in and near the Study Area

5.3.1 Historical Sites

Two European heritage items were identified in the course of the 2004 field surveys for the Nambucca District Water Supply project. These comprise a forestry tree stump with springboard holes, and the remains of a charcoal kiln (as identified by Gorman in 1996). Site locations are shown in Figure 5.1.



5.3.2 Aboriginal Archaeological Sites

Gorman conducted a field survey within the 1996 'Site 2' dam option, concentrating on creek lines and forestry tracks. She noted that visibility along the creek was 0% and that the gully slopes within the Viewmont State Forest were steep, with vegetation thick to the point of being impenetrable (Gorman 1996:37). Visibility was also poor in the cleared pasture lands where effective survey was limited creek lines, cattle tracks and small discrete ground surface exposures. There is no data in the report that indicates where Gorman actually surveyed. No Aboriginal sites or artefacts were identified in the course of Gorman's 1996 survey.

One possible Aboriginal object (NSW1) was found approximately 50 m from the proposed impoundment maximum storage level in the course of the 2004 field surveys. This item, a manuport, was a dark grey/brown, fine-grained volcanic alluvial cobble with a light grey/green patina. (A manuport is an object or fragment of an object carried by human agency to the locality in which it is found, but which may not display any other features of past use). It is not certain that the manuport had an Aboriginal origin, however most non-Aboriginal explanations, such as a hearth stone, road or construction material were largely discounted. Site locations are shown in Figure 5.1.

A review of the Department of Environment and Climate Change's Aboriginal Heritage Information Management System (AHIMS) for the 2008 study area indicates that there are no additional Aboriginal sites within the study area.

5.3.3 Sites Identified by Aboriginal Informants

The following sites were identified by local informants to Alice Gorman in 1996. The text is taken verbatim from Gorman's report.

'Burial grounds

Mr Ussher recalled finding an "unusual" stone near the river at the back of his property, on the other side of Bellingen Road. It was shown to Mrs Bernadette Wilkes of Macksville who identified it as a men's object. It may have been a piece of scared quartz such as those used in initiation or by Ulungarras. The area of the river where it was found was used for burials, and is considered to be dangerous; stories are still being told about it. According to one woman, burials were still being carried out there in the time of one of her uncles. No swimming or fishing is allowed in that part of the river; and anyone who ventured there at night would be tormented.

A burial ground is referred to in the reminiscences of Douglas J. Mackay, near a camp on his father's property. The burial ground was selected about two miles from Bowraville (Dornan 1951). He may be referring to the mission cemetery site.

Further areas, including parts of the racecourse, the Memorial Park, which is opposite the Mission, and the burial area are deemed dangerous places.

A Dreaming Track stemming from a mythological site on a rise near the study area runs north along the ridge and through the State Forest portion of the preferred site [not in the 2b study area; refer Figure 5.2]. A Keepara (corroboree) ground has been reported to be situated between the camp near the homestead of Argents Hills and a further campsite.

Mythological sites

Mr Larry Kelly spoke of a mythological site located on a rise near the study area. Once he took his brother-in-law to this place. The devil who occupied it followed them while they ran, panicking, back to the mission. They were met by one of the Elders who asked where they had come from. They told him, and then they saw the devil behind them. The Elder gathered all the other Elders and they drove the devil back to the site, where he has remained. The site was a dangerous place to go by night or day.

A Dreaming track ran from this site along the ridge that runs through the State Forest portion of Site 2. This was used as a travelling route north, and Mr Kelly was one of the last people to use it as such.



Lil Graham relates that her husband Alec had seen groups of Aboriginal people camping in bush around this area. In general, after the establishment of the reserve Aboriginal people did not use the area north of Bowraville because of its mythological significance (Bobby Kelly personal communication 15/10/96). This may be related to the breakdown of avenues of knowledge transmission, resulting in a lack of the correct information to safely navigate these areas.

Dangerous places

Other parts of the area were also dangerous to go to. Bobby Kelly relates that parts of the racecourse site, where the Gumbaingirri and the Thungutti had battled, were out of bounds. As well as the burial area, there used to be other parts of the Nambucca River that could not be travelled without the presence of an Elder.

An Aboriginal woman who lived on a property near the study area in the 1970s related the following story. When she moved there she was unaware that the area had any significance. Soon after her arrival what she called "corroborees on the roof" began: a constant pounding that prevented the family from sleeping. She knew that it was caused by spirits of the ancestors, and called on her uncle for help. Every night for a week he went outside and spoke to the spirits in "the lingo" (a common term for Aboriginal languages). After this he told her that she should have no more disturbances, which was the case.

Even within the bounds of Bowraville there were dangers for the incautious. The woman referred to above grew up on the Mission. There was a being known as "Brown Jack" who would coax children away after dark: they were all frightened of him. If the children wandered into places they shouldn't be, her father would make a clear whistle, and they would know not to go back there. The present Memorial park opposite the Mission was bush in those days, and dangerous to cross. Bobby Kelly remembers being afraid to cross the road there before the park was built. However, there were still many safe places. The children would go out to collect blackberries, wattle gum, lemons (there were many fruit trees growing in the bush according to Richard Kelly) and other bush foods. One favourite route was through Cunningham Park, up the mountain and through to the Mackay's banana plantation.

Ceremonial grounds

Around 1967 Robert Dornan interviewed Mrs Bob Brown, who came to the Nambucca region in 1883, and moved to Bowraville in 1907. According to her "there was an aboriginal corroboree ground near where the present public park is situated" (Dornan 1951). Another reference to a Keepara ground comes from the Argent Story. It was situated between the camp near the homestead on Argents Hill and another campsite, about three hundred metres up the hill. The carved trees associated with it were still standing in the late 1950s (The Argent Story Part 3).

According to Alex Gaddes, the "Gussakai" mountain on the Buccrabendinni tributary of the Nambucca River was the Keepara ground where tribal elders were inducted. The race course was also used as a ceremonial ground for more social gatherings (Gaddes 1990:155)

Camping Places

According to Mrs Bob Brown the site of the reserve was a traditional camping place and there [sic] was another where the CWA rooms now are (Dornan 1951) despite the presence of the burial ground, and mythological site to the north of Bowraville, it seems likely that this area was used for living before the mission. Alec Graham had seen camping sites in use near his property (Lil Graham personal communication 14/19/96). Douglas J. Mackay recalls an Aboriginal camp on his father's property "where many lived and died" (Dornan 1951), indicating a more permanent settlement.

At Argents Hill, "There were two Aboriginal camps in the near vicinity, one within three hundred metres of the homestead where the Argents Hill Presbyterian Church once stood. With others, the Dhottis lived there and another "wild old man called Benny" (The Argent Story Part 3).

Conclusion

Although it is clear that the landscape around Bowraville contains many areas of significance to the local Aboriginal community, none are located directly on Site 2 [note that in 1996 site 2 included both Options



2A and 2B], and during consultation no concerns were raised about the construction of the dam at this location (Gorman 1996:38-40).

The general locations mentioned in Gorman's oral history are shown below in Figure 5.2. As noted in her conclusions, none of the sites/locations will be directly impacted by the proposed dam and associated infrastructure.

An area referred to as 'The Rocks' burial ground near the Nambucca River was identified to the consultants in the course of the 2004 study as being of particular significance to the local Aboriginal community. The site is situated on the Nambucca River approximately one kilometre upstream of Bowraville (Figure 5.2).

Three areas were identified as a result of the 2007 'walkthrough':

1. A corroboree ground on the flat area on the inside of the bend in the Nambucca River on the S-W corner of property no. 13.
2. Burial grounds adjacent to the river on both sides - up to 30 m from the edge of the river - as shown hatched on properties 5, 10, 11, 12 and 13.
3. A Mythological Area adjacent to South Creek - up to 30m from the edge of the river - as shown hatched on properties 24, 25, 26, 27, 28.

Two of these areas, the corroboree and the burial ground are a part of 'The Rocks' area.

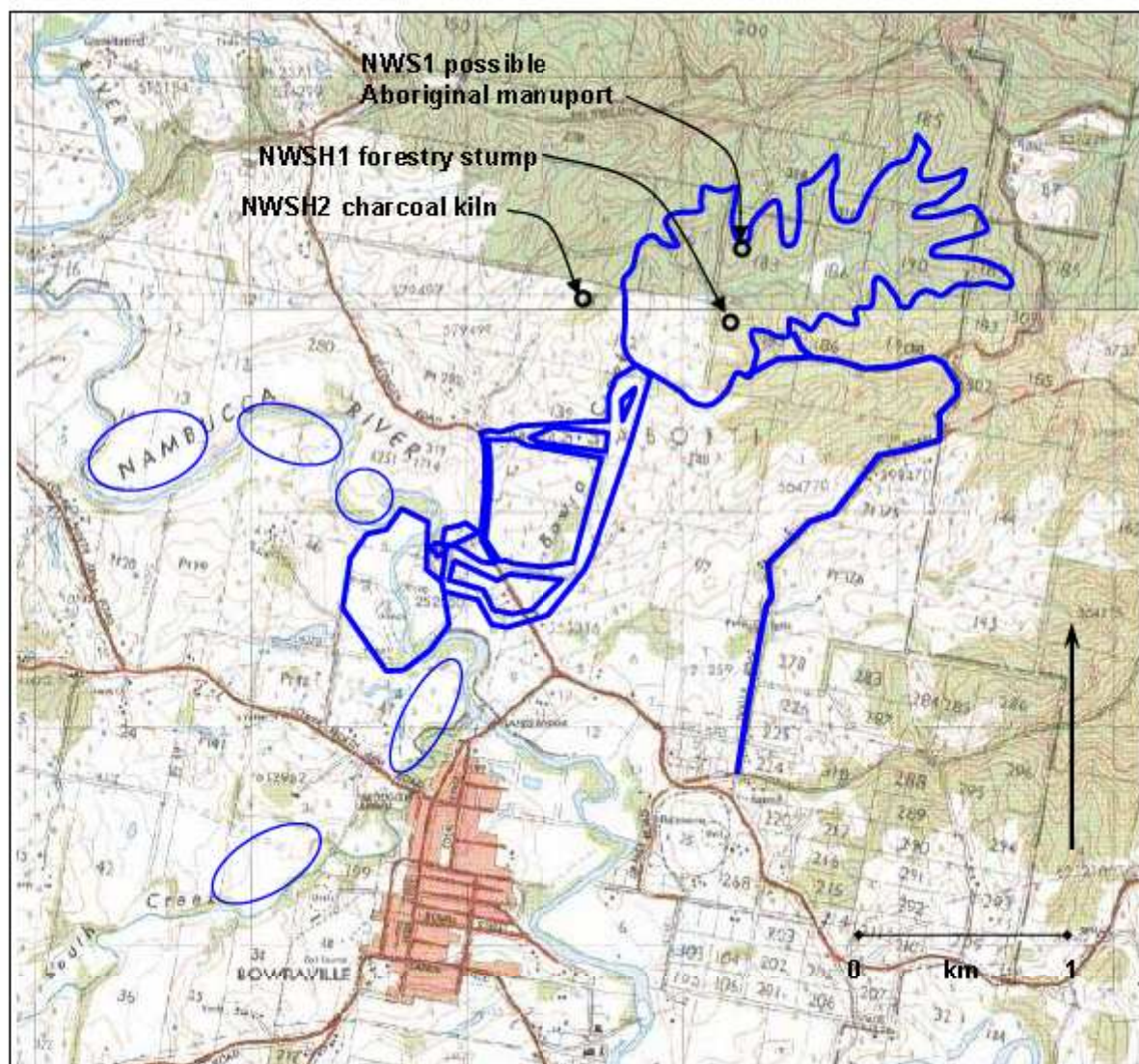


Figure 5.1 Location of previously identified heritage recordings within and near the study area. (Macksville and Missabotti 1:25,000 topographic 2nd Ed maps CMA; generated using TopoView).

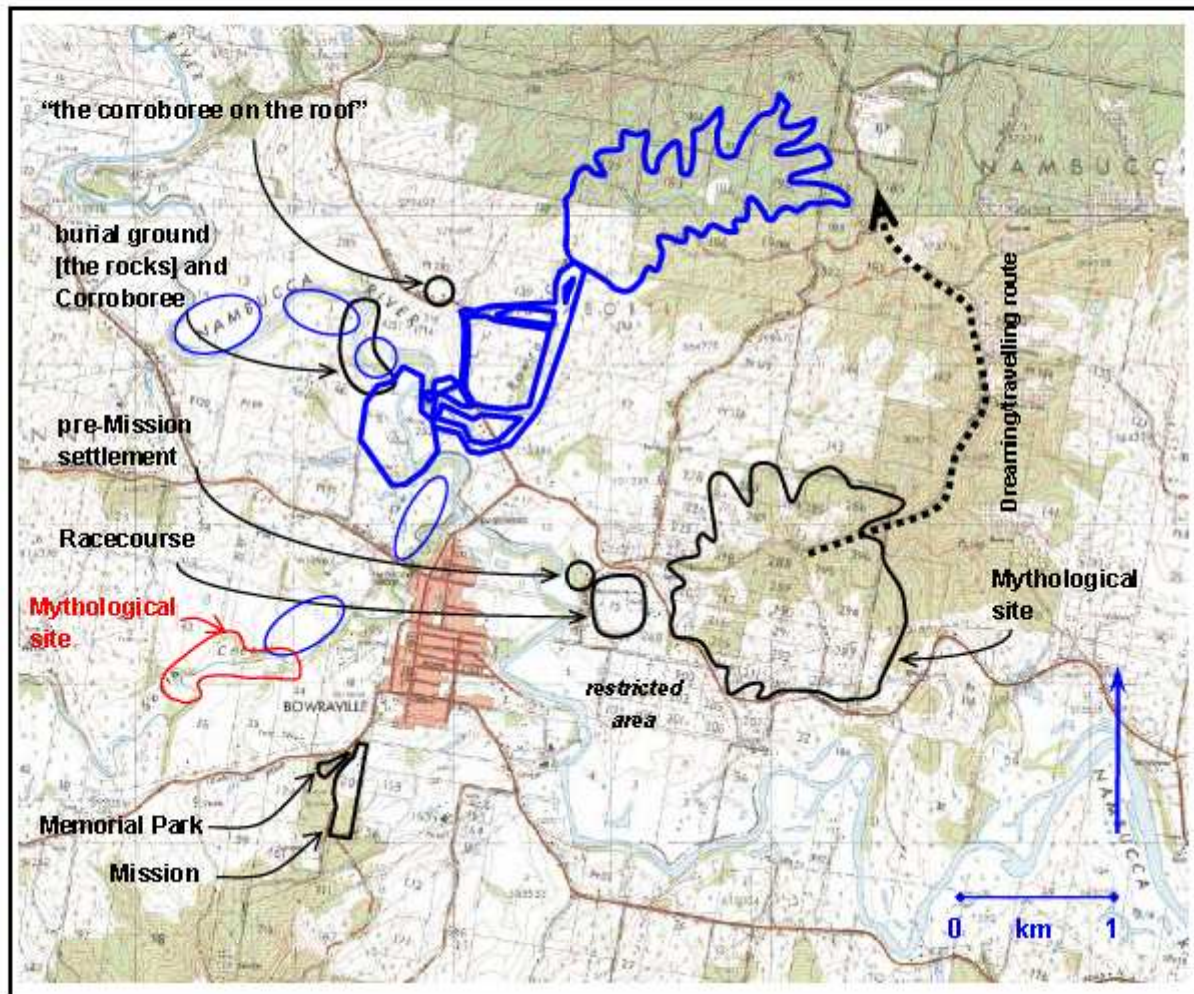


Figure 5.2 Location of non-archaeological Aboriginal heritage sites recorded by Gorman (1996) in the vicinity of the study area and the mythological site identified in 2007 (red) (base maps: Macksville and Missabotti 1:25,000 topographic 2nd Ed maps CMA; generated using TopoView).



6. RESULTS

6.1 Summary

One possible Aboriginal object (a manuport, NSW1) was recorded in 2004. The manuport is located 50 m from dam sub-option 2b impoundment maximum storage level.

One area of potential Archaeological Deposit, NWSPAD1, was recorded in the course of the 2008 field survey. The PAD is located in the section of Bowra Creek flats and basal slopes traversed by proposed pipeline routes 1, 3, 4 and 5.

Two areas of Aboriginal cultural value, the burial ground [the rocks] and a corroboree area, and a mythological site, was identified by Aboriginal informants. The Rocks is located on the Nambucca River and a buffer zone of 30 m either side of the river has been identified (this area may be impacted by new boreholes). The mythological site is located on South Creek (this area may be impacted by new boreholes).

Two European heritage items, a forestry tree stump with springboard holes and the remains of a charcoal kiln, were recorded in 2004.

- The forestry tree stump (NWSH1) is located approximately 100 m northeast of the cleared paddock edge of the eastern boundary of portion 152 (Ussher's farm) and within the dam impoundment area.
- The charcoal kiln (NWSH2) is located on the crest of a spurline shoulder, at the edge of a small forest remnant within dairy farm grasslands to the west (and outside of) the dam impoundment area.

No European heritage sites were located in the context of the 2008 field survey.

Sites and PAD locations are shown on Figure 6.11.

6.2 Aboriginal Sites

Possible Aboriginal Manuport – Nambucca Water Supply 1 (NWS1)

AGD: 0487291.6612228

This item, recorded in 2004, is a dark grey/brown, fine-grained volcanic alluvial cobble with a light grey/green patina (Figure 6.1). The cobble is broken transversely and retains an alluvial surface with a weathered cortex over 90% of its surface. There is some recent flake removal and one old flake scar with a degree of weathering. The dimensions of the item are: 156 x 112 x 57 mm.

The item was found on a well graded and excavated forestry track platform (Step Road), situated on the crest of a spurline shoulder, some 50 m from, and 10 m higher than the proposed maximum storage level. The track was approximately six metres wide in this location (Figure 6.2). No other alluvial pebbles were visible on the track or on adjacent natural ground. There does not appear to be any imported or road metal gravels in the general vicinity.

This item is classified as a manuport, that is, an object or fragment of an object carried by human agency to the locality in which it is found, but which may not display any other features of past use. It is not certain that the manuport has an Aboriginal origin, however most non-Aboriginal explanations, such as a hearth stone, road or construction material can be largely discounted. There remains a possibility that it represents random loss from heavy machinery, an open vehicle or a tray back.

Fred Walker explained that he thought it was likely that the manuport was a broken hatchet head or hand axe. The missing portion of the manuport would have included a flaked or ground edge. Mr Walker's interpretation was based partly on the well balanced nature of the stone when held in the hand, and natural depressions which may have been utilised for hafting the pebble. River cobbles of



this size do not occur in the Nambucca River, which suggested to Mr Walker that the cobble must have come from the Bellinger River.

Exposure incidence in the area was 90% and visibility in the exposure was about 95%.



Figure 6.1 NWS1 – alluvial cobble manuport



Figure 6.2 Location of NWS1

Nambucca Water Supply PAD1 (NWSPAD1)

GDA 486800.6611480 to 486400.6610690

This potential archaeological deposit comprises creek flats and basal slopes associated with Bowra Creek. (Figures 6.3 and 6.4). Proposed pipeline routes 1, 3, 4 and 5 run parallel to Bowra Creek and through NWSPAD1 (from the already formed vehicle tracks to Bellinger Drive).

Visibility along the pipeline routes in the area of the PAD was very poor at <5%. It is considered that there is moderate potential for subsurface archaeological deposits to be present in this area and for these deposits to be relatively intact.



Figure 6.3 NWPAD1 looking south



Figure 6.4 NWPAD1 looking south

6.3 Aboriginal Cultural Values

The Aboriginal cultural values of the study area are outlined in Section 5.3. During the 2008 field survey Aboriginal representative Mr Kevin Ballangarry reiterated the locations of these areas and was particularly concerned about the burial ground [the rocks] and corroboree area, indicating that in this area there should be a 30 m buffer on either side of the river.



Mr Ballangarry also expressed concern over the Dam inundation area as he believes that there are sites within this area. Mr Ballangarry indicated that the local community would like to inspect the inundation area following any initial ground disturbance.

6.4 European Sites

Forestry Stump and Felled Trunk – Nambucca Water Supply Historic 1 (NWSH1)

AGD 487232.66120512

This site consists of a large standing tree stump with springboard slots, and a fallen section of the sawn and felled tree trunk (Figure 6.5). The stump is 4.7 m in circumference (at breast height) and is located on the creek (west) side of an overgrown vehicle track that is approximately 100 m northeast of the cleared paddock edge of the eastern boundary of portion 152 (Ussher's farm).

The tree has been felled with a cross-cut saw and cut approximately 2.4 m above the ground. A springboard slot, 16 cm wide, 7 cm high and 12 cm deep is situated 1.6 m above the ground on the eastern face of the stump (Figure 6.5 detail). Several shallow axe slots occur below this, at 1.4 and 1.5 m above the ground. A step, 60 cm wide and inset 20 cm and 60 cm high has been cut below the shallow axe marks, at 1 m above the ground. Another springboard slot, 16 cm wide, 5 cm high and 6 cm deep has been cut on the southern stump face, approximately 1.7 m above the ground, with a shallow axe mark also placed next to it 40 cm to the left. Some 20 cm above the slot is cut bench, 50 cm wide and 20 cm deep.

A long section of now rotten tree trunk is situated 15 m away from the stump. The trunk is about 28 m long and has a diameter of 85 cm at its proximal end. It is aligned 198° and extends to the bank of Bowra Creek (Figure 6.5). This is probably the remaining section of the felled trunk, which indicates that a bole of approximate 15 m length was harvested following the tree felling.

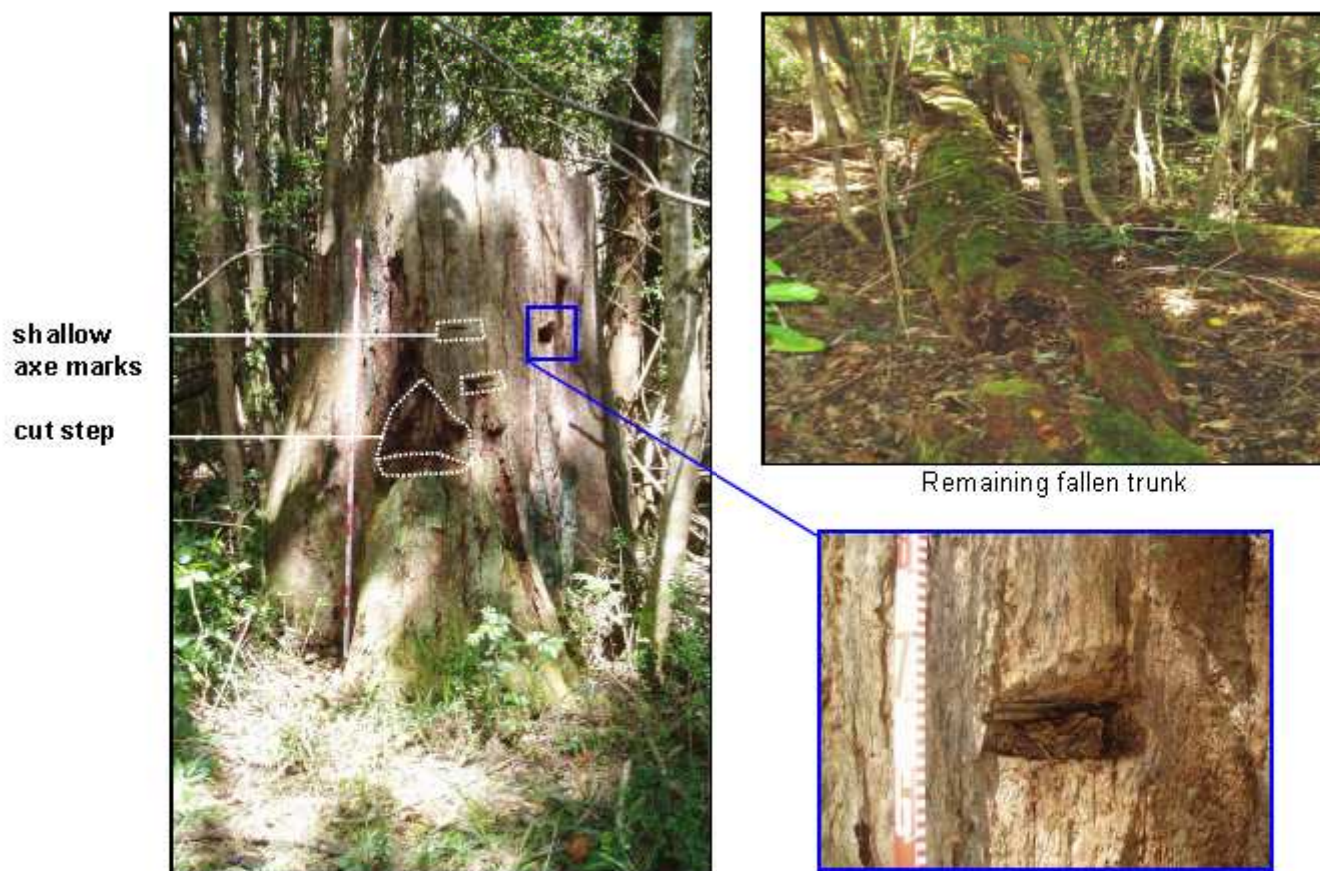


Figure 6.5 NWSH1 – Forestry stump and felled trunk, with detail of springboard slot.



Remains of Charcoal Kiln – Nambucca Water Supply Historic 2 (NWSH2)

AGD 486538.6611983

This item was reported to Gorman in 1996 by local landowner Alan Ussher. The following information was provided by local informants, Alan Ussher, Jim Fowler, and Lil Graham to Gorman in 1996.

The charcoal kiln was operated by Alec Graham during World War II. Charcoal was used to run gas producers that were an alternative source of vehicle fuel during the war. The operation consisted of one earth kiln and one brick lined kiln, dug into the ground next to each other. A fire was lit and the wood put into the earth kiln to burn to charcoal. It was then doused with water, dug out and transferred to the brick kiln, which could attain a higher temperature. Any unburnt wood would be consumed in this kiln and the process finished. After a second dousing the charcoal would be bagged and taken to Macksville for sale (Gorman 1996:40, 41).

This site was re-inspected with Mr Ussher in November 2004.

The site is located on the crest of a spurline shoulder, at the edge of a small forest remnant within dairy farm grasslands (Figures 6.6). The site now comprises a shallow rectangular and elongated earthen pit with approximate dimensions 3.4 m long and 1.2 m wide. Low spoil mounds are located on the eastern side of the pit and cover an area of 3 x 2.6 m. The pit is aligned at right angles to the spurline (318°), and is situated 2 m from a vehicle track that traverses the spurline. The track follows a fenceline and cuts off a small bend in a presumably older but better benched track, situated just downslope of the fenceline track (Figure 6.6). The pit is now 55 cm deep but has clearly filled with forest litter and sediment since its abandonment. No evidence for bricks or a former brick lining was evident in or around the pit.

Approximately 70 m southwest along the track from the pit, a small scatter of brick fragments was encountered (Figure 6.9 and 6.10). These may be traces of the bricks used in the reported brick kiln, and which were presumably later removed and reused. Two of the three fragments appear to be hand moulded sandstock bricks with a coarse aggregate and no frog (10.5 cm wide and 7.7 cm deep). The other fragment is clearly later in age, being machine moulded and with a rectangular frog (7.7 cm deep). If all of these fragments relate to the charcoal kilns, then it suggests that bricks for the kiln were collected from a number of sources, including probable nineteenth century former structures.



Figure 6.6 General view of location of charcoal pit – NWSH2 (right, next to 2 scale), looking southwest.



Figure 6.7 NWSH2 – View of pit remains looking northwest.



Figure 6.8 NWSH2 – View of pit remains from current track way, looking northwest.



Figure 6.9 Brick remnants found in general vicinity of NWSH2



Figure 6.10 Reverse side of brick remnants found in general vicinity of NWSH2. Not machine moulded brick fragment on right

6.5 Inventory of Site and PAD Locations

Recording Type	Recording Code	GDA Reference	Potential Impact
Aboriginal isolated find	NWS1	487396.6612417	dam impoundment
Aboriginal PAD	NWPAD1	486800.6611480 to 486400.6610690	pipeline routes 1, 3, 4 and 5
Aboriginal burial ground and corroboree area	The Rocks		borefield
Mythological Site	MS		borefield
forestry stump	NWSH1	487337.6612701	dam impoundment
remains of charcoal kiln	NWHS2	486643.6612172	no impact

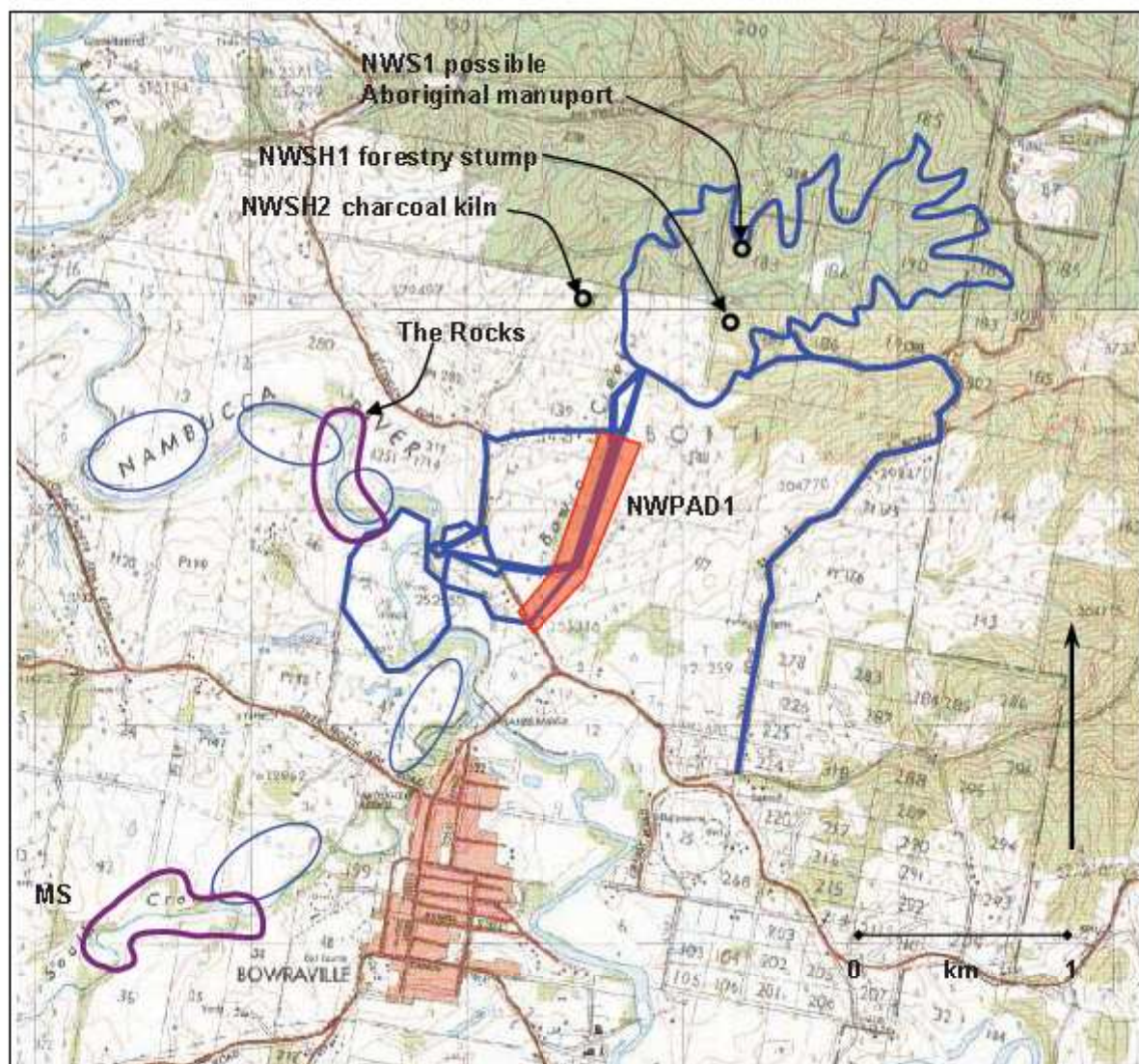


Figure 6.11 Location of identified heritage recordings within and near the study area.
(Macksville and Missabotti 1:25,000 topographic 2nd Ed maps CMA; generated using TopoView).

6.6 Survey Coverage and Visibility Variables

The effectiveness of archaeological field survey is to a large degree related to the obtrusiveness of the sites being looked for and the incidence and quality of ground surface visibility. Visibility variables were estimated for all areas of comprehensive survey within the study area. These estimates provide a measure with which to gauge the effectiveness of the survey and level of sampling conducted. They can also be used to gauge the number and type of sites that may not have been detected by the survey.

Ground surface visibility is a measure of the bare ground visible to the archaeologist during the survey. There are two main variables used to assess ground surface visibility, the frequency of exposure encountered by the surveyor and the quality of visibility within those exposures. The predominant factors affecting the quality of ground surface visibility within an exposure are the extent of vegetation and ground litter, the depth and origin of exposure, the extent of recent sedimentary deposition, and the level of visual interference from surface gravels. Two variables of ground surface visibility were estimated during the survey:

- A percentage estimate of the total area of ground inspected which contained useable exposures of bare ground; and



- A percentage estimate of the average levels of ground surface visibility within those exposures. This is a net estimate and accounts for all impacting visual and physical variables including the archaeological potential of the sediment or rock exposed.

The obtrusiveness of different site types is also an important factor in assessing the impact of visibility levels. For example, artefacts made from locally occurring rock such as quartz may be more difficult to detect under usual field survey conditions than rock types that are foreign to the area. The impact of natural gravels on artefact detection was taken into account in the visibility variables estimates outlined above.

The natural incidence of sandstone platforms suitable for grinding grooves or engraving, together with the incidence of old growth trees, are important considerations in identifying both survey effectiveness and site location patterns outside of environmentally determined factors.

Visibility across the study area was exceptionally poor due to high grass cover. The disturbance incidence was <5% with 30% visibility within those areas.

Survey was undertaken on foot and all pipeline and access road routes were walked. All bore hole locations were visited and either surveyed individually or viewed from a distance depending on the on-ground visibility.



7. SIGNIFICANCE ASSESSMENT

7.1 Aboriginal Heritage

7.1.1 Assessment Criteria

The Burra Charter of Australia defines cultural significance as 'aesthetic, historical, scientific or social value for past, present and future generations' (Aust. ICOMOS 1987). The assessment of the cultural significance of a place is based on this definition but often varies in the precise criteria used according to the analytical discipline and the nature of the site, object or place.

In general, Aboriginal archaeological sites are assessed using five potential categories of significance:

- significance to contemporary aboriginal people;
- scientific or archaeological significance;
- aesthetic value;
- representativeness; and
- value as an educational and/or recreational resource.

Many sites will be significant according to several categories and the exact criteria used will vary according to the nature and purpose of the evaluation. Cultural significance is a relative value based on variable references within social and scientific practice. The cultural significance of a place is therefore not a fixed assessment and may vary with changes in knowledge and social perceptions.

Aboriginal significance can be defined as the cultural values of a place held by and manifest within the local and wider contemporary Aboriginal community. Places of significance may be landscape features as well as archaeologically definable traces of past human activity. The significance of a place can be the result of several factors including: continuity of tradition, occupation or action; historical association; custodianship or concern for the protection and maintenance of places; and the value of sites as tangible and meaningful links with the lifestyle and values of community ancestors. Aboriginal cultural significance may or may not parallel the archaeological significance of a site.

Scientific significance can be defined as the present and future research potential of the artefactual material occurring within a place or site. This is also known as archaeological significance.

There are two major criteria used in assessing scientific significance:

1. The potential of a place to provide information which is of value in scientific analysis and the resolution of potential research questions. Sites may fall into this category because they: contain undisturbed artefactual material, occur within a context which enables the testing of certain propositions, are very old or contain significant time depth, contain large artefactual assemblages or material diversity, have unusual characteristics, are of good preservation, or are a constituent of a larger significant structure such as a site complex.
2. The representativeness of a place. Representativeness is a measure of the degree to which a place is characteristic of other places of its type, content, context or location. Under this criteria a place may be significant because it is very rare or because it provides a characteristic example or reference.

The value of an Aboriginal place as an educational resource is dependent on: the potential for interpretation to a general visitor audience, compatible Aboriginal values, a resistant site fabric, and feasible site access and management resources.

The principal aim of cultural resource management is the conservation of a representative sample of site types and variation from differing social and environmental contexts. Sites with inherently unique features, or which are poorly represented elsewhere in similar environment types, are considered to have relatively high cultural significance.



The cultural significance of a place can be usefully classified according to a comparative scale which combines a relative value with a geographic context. In this way a site can be of low, moderate or high significance within a local, regional or national context. This system provides a means of comparison, between and across places. However it does not necessarily imply that a place with a limited sphere of significance is of lesser value than one of greater reference.

The following assessments are made with full reference to the scientific, aesthetic, representative and educational criteria outlined above. Reference to Aboriginal cultural values has also been made where these values have been communicated to the consultants. It should be noted that Aboriginal cultural significance can only be determined by the Aboriginal community, and that confirmation of this significance component is dependent on written submissions by the appropriate representative organisations.

7.1.2 The Study Area

Possible Aboriginal Manuport - Nambucca Water Supply 1 (NWS1)

An Aboriginal origin cannot be definitely ascribed to the isolated manuport NWS1, based solely on the archaeological evidence. The Aboriginal representatives present during the survey however were more confident of its origin, based on their own cultural interpretations.

Manuports of this nature in disturbed contexts are not usually considered to have archaeological significance based on any of the criteria defined above. However, this item is likely to have a degree of Aboriginal cultural significance based on the interpretations of local Aboriginal community representatives.

7.2 European Heritage

7.2.1 Assessment Criteria

The NSW Heritage Office has defined a methodology and set of criteria for the assessment of cultural heritage significance for items and places, where these do not include Aboriginal heritage from the pre-contact period (NSW Heritage Office & DUAP 1996, NSW Heritage Office 2000). The assessments provided in this report follow the Heritage Office methodology.

The following heritage assessment criteria are those set out for Listing on the State Heritage Register. In many cases items will be significant under only one or two criteria. The State Heritage Register was established under Part 3A of the Heritage Act (as amended in 1999) for listing of items of environmental heritage that are of state heritage significance. Environmental heritage means those places, buildings, works, relics, moveable objects, and precincts, of state or local heritage significance (section 4, Heritage Act 1977).

An item will be considered to be of State (or local) heritage significance if, in the opinion of the Heritage Council of NSW, it meets one or more of the following criteria:

- Criterion (a)** an item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area);
- Criterion (b)** an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local area);
- Criterion (c)** an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area);
- Criterion (d)** an item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons;
- Criterion (e)** an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area);
- Criterion (f)** an item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area);



- Criterion (g)** an item is important in demonstrating the principal characteristics of a class of NSW's
- cultural or natural places; or
 - cultural or natural environments.
- (or a class of the local area's
- cultural or natural places; or
 - cultural or natural environments.)

An item is not to be excluded from the Register on the ground that items with similar characteristics have already been listed on the Register. Only particularly complex items or places will be significant under all criteria.

In using these criteria it is important to assess the values first, then the local or State context in which they may be significant.

Different components of a place may make a different relative contribution to its heritage value. For example, loss of integrity or condition may diminish significance. In some cases it is constructive to note the relative contribution of an item or its components. Table 8.1 provides a guide to ascribing relative value.

Table 8.1 Guide to ascribing relative heritage value

Grading	Justification	Status
Exceptional	Rare or outstanding item of local or State significance. High degree of intactness Item can be interpreted relatively easily.	Fulfils criteria for local or State listing.
High	High degree of original fabric. Demonstrates a key element of the item's significance. Alterations do not detract from significance.	Fulfils criteria for local or State listing.
Moderate	Altered or modified elements. Elements with little heritage value, but which contribute to the overall significance of the item.	Fulfils criteria for local or State listing.
Little	Alterations detract from significance. Difficult to interpret.	Does not fulfil criteria for local or State listing.
Intrusive	Damaging to the item's heritage significance.	Does not fulfil criteria for local or State listing.

7.2.2 The Study Area

Forestry Stump and Felled Trunk - Nambucca Water Supply Historic 1 (NWSH1)

The forestry stump and felled trunk NWSH1 is demonstrative of a past forestry harvesting method no longer practiced. It contains a range of surface features that relate to the technique of manually felling a large tree with axes and a cross cut saw. The site is however in relatively poor condition, with wood rot and termite activity widespread throughout the internal tissues of the stump and felled trunk. The site is also situated in a location poorly suited for public interpretation, being difficult to



access and now surrounded by a tree plantation and regrowth. This site is typical of many such stumps which still remain within the current and former forest areas subject to tree harvesting.

Based on its relatively poor condition, modified context, and lack of rarity, this site is assessed as having little heritage significance and is not considered to fulfil the criteria for local or State listing.

Remains of Charcoal Kiln - Nambucca Water Supply Historic 2 (NWSH2)

The reported charcoal pit NWSH2 has been substantially modified and survives as an archaeological site only, with low ground relief providing the only above ground evidence. Apart from small traces of brick, there are no traces of the reported additional brick kiln. The site is now difficult to interpret and without the aid of oral history, would not be distinguishable from other indeterminate and superficial agricultural ground works. As a consequence, this site is assessed as having little heritage value and is not considered to fulfil the criteria for local or State listing.



8. RECOMMENDATIONS

One possible Aboriginal Object (NWS1) has been previously identified approximately 50 m from the proposed impoundment maximum storage level in the course of the 2004 survey of the dam impoundment area. Site NWS1 would not be inundated when the dam is full.

No Aboriginal sites were located in the course of the 2008 survey of ancillary areas.

One area of Potential Archaeological Deposit (NWPAD1) was identified in the course of the 2008 survey. Proposed pipeline routes 1, 3, 4 and 5 traverse the PAD area.

Two European heritage items, a forestry tree stump (NWSH1) and the remains of a charcoal kiln (NWSH2) have been previously identified in or near the project area. Site NWSH1 will be inundated when the dam fills.

No European sites were located in the 2008 field survey of ancillary areas.

Several areas of cultural significance have been identified by the local Aboriginal community. Two of these areas a burial ground [the rocks] and corroboree and a mythological site may be impacted by the project.

The Nambucca has over time been used for various cultural pursuits including swimming, fishing and as a food resource. As environmental flows in the river will be maintained as part of this project there will be no impact on this aspect of the study area.

8.1 Aboriginal Sites

It is recommended that:

1. No further archaeological survey is required for the Nambucca Water Supply Project dam and ancillary areas.
2. The possible Aboriginal manuport NWS1 should be collected prior to any potential impact and should be curated by the local Aboriginal community. Alternatively, this item could be re-positioned near to its find location but outside of any impact zones. A section 87 permit (and a Care and Control Agreement for the collection option) would be required from the DECC to conduct these actions.
3. If NWPAD1 is to be impacted by the installation of pipelines then a program of archaeological subsurface investigation should be undertaken with the aim of determining the nature, extent and significance of any subsurface archaeological deposit present within the area.
4. Impact to the identified burial ground and corroboree ground [the rocks] and the identified mythological site should be avoided. Advice should be sought through the project Aboriginal Liaison Committee as to appropriate avoidance strategies and buffer zones for these areas.

A buffer zone of 30 m either side of the river has been identified by Aboriginal representatives for The Rocks area and this strategy should be discussed further by the Aboriginal Liaison Committee.

5. To minimise potential delays in construction resulting from the identification of unidentified Aboriginal sites it is proposed that after initial vegetation clearance Aboriginal representatives and archaeologists should undertake an inspection of the inundation area. This would provide an opportunity to locate and collect any sites that may not have been able to be seen during the surveys. A s87 will be required to do this.
6. Copies of this report should be provided to the Bowraville Local Aboriginal Land Council and the project Aboriginal Liaison Committee with an invitation to:



- discuss and comment on its findings,
- provide assessments of the Aboriginal cultural values of the sites and areas described in the report, and
- provide input to the management strategies suggested in the report.

7. Three copies of this report should be forwarded to the DECC for their review and comment.

NSW Department of Environment & Climate Change
North East Branch
PO Box 914
COFFS HARBOUR NSW 2450

8.2 Historic Sites

It is recommended that:

8. Notification of the intention to impact the forestry stump, site NWSH1, should be provided in writing to the Director of the NSW Heritage Office with a request that a determination be made as to whether the intended impact falls under an existing exemption to section 139 permit provisions.

No impact can occur until this advice is received and acted upon. This procedure is necessary because this site falls under the definition of a relic (as defined by the *Heritage Act 1977*), but has not been assessed as having local or a greater level of significance.



9. REFERENCES

- Gorman, A. C. 1996 Nambucca District Water Supply: An Archaeological Investigation of Aboriginal and European Heritage at Bowraville, NSW. Department of Archaeology and Palaeoanthropology. University of New England, Armidale. Report for the NSW Department of Public Works and Services.
- Navin Officer Heritage Consultants 2004 Nambucca District Water Supply Storage Dam Site 2B and Ancillary Works Areas - Cultural Heritage Assessment. Report to Nambucca Shire Council Department of Energy Utilities and Sustainability on behalf the NSW Department of Commerce.
- Navin Officer Heritage Consultants (October) 2008 Nambucca District Water Supply Environmental Impact Assessment. Preliminary Cultural Heritage Report. Report to GHD

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APPENDIX 1

MINUTES OF ABORIGINAL LIAISON COMMITTEE MEETINGS



Nambucca District Water Supply Bowraville Off-River Storage

Aboriginal Liaison Committee Meeting #1

MINUTES

DATE: Tuesday 20 November 2007

TIME: 10:30 a.m. to 12:30pm

LOCATION: Council Chambers, Macksville

Attendee's

Anne Edwards (Elder – Gumbaynggirr Traditional Owners Group)
 Larry Kelly (Elder – Gumbaynggirr Traditional Owners Group)
 Martin Ballangarry (NSC- Councillor & Gumbaynggirr Traditional Owners Group)
 Beryl Wilson (Ngurralla Aboriginal Corporation)
 Michele Donovan (Unkya LALC)
 Sam Bula (Unkya LALC)
 Caine Rosser (Unkya LALC)
 Roger Mehr (DECC)
 Victor Buchanan (DECC)
 Glen George (DWE)
 Richard Spain (NSC).
 Damien Grace (Commerce)
 Tim Alexander (Commerce)
 Vince Joseph (Commerce)

Apologies

Paula Flack (NSC- Councillor)
 Brian Flanders (Bowraville LALC)
 Barry Donovan (Ngurralla Aboriginal Corporation)

Actions.

	ACTION	By Who	By When
	Send out color maps of scheme to Community.	TA	27/11/07
	Provide feedback on terms of reference.	All	Next mtg
	Provide feedback on other appropriate members.	All	2 wks before next mtg
	Distribute protocols from Shannon Creek project. (DG – to check intellectual property)	TA	30/11/07
	Consult with Larry Kelly and Anne Edwards to identify any possible gender issues so that appropriate archaeologists can be used.	TA	30/11/07



	Cultural heritage study to be undertaken on the borefields. Contact LALC regarding study / arrange walkthrough	TA	01/08
	Prepare and issue Tender for engagement of aboriginal heritage consultants.	TA	30/11/07
	Advise on Keeping Place protocol .	LK/MB	Next mtg
	Distribute Project Information to Anne so that she can pass onto elders.	TA	27/11/07

Close 12.30

Next Meeting

5 February 2008



Nambucca District Water Supply Bowraville Off-River Storage

Aboriginal Liaison Committee Meeting #2

MINUTES

DATE: Tuesday 5 February 2008
TIME: 10:30 a.m. to 12:00pm
LOCATION: Council Chambers, Macksville

Attendee's

Martin Ballangarry (NSC- Councillor & Gumbaynddirr Traditional Owners Group)
Paula Flack (NSC- Councillor)
Brian Flanders (Bowraville LALC)
Lloyd Lynwood (Bowraville LALC)
Caine Rosser (Unkya LALC)
Richard Spain (NSC).
Tim Alexander (Commerce)

Apologies

Beryl Wilson (Ngurralla Aboriginal Corporation)
Glen George (DWE)
Damien Grace (Commerce)
Vince Joseph (Commerce)

Actions.

	ACTION	By Who	By When
	Approach Ngurralla Aboriginal Corporation about holding the next meeting at their offices	TA	08/02/08
	Commerce to provide update reports to Bowraville Local Aboriginal Land Council (Lloyd Lynwood) for reporting to ACAC	TA	Ongoing - Monthly before ACAC meetings
	Advise on Keeping Place protocol .	LK/MB	Next mtg

Close 12.00

Next Meeting

1 April 2008

2008 Meetings Schedule: 1 April '08; 3 June '08; 5 August '08; 7 October '08; 2 December '08; 3 February '09



Nambucca District Water Supply Bowraville Off-River Storage

Aboriginal Liaison Committee Meeting #4

MINUTES

DATE: Tuesday 3 June 2008

TIME: 10:30 a.m. to 12:00pm

LOCATION: Ngurralla Aboriginal Corporation, Macksville

Attendee's

Paula Flack (NSC - Councillor)
Ann Edwards (Gumbaynggirr Traditional Owners Group)
Kevin Ballangarry (Gumbaynggirr Traditional Owners Group)
Caine Rosser (Unkya LALC)
Beryl Wilson (Ngurralla Aboriginal Corporation)
Richard Spain (NSC).
Tim Alexander (Commerce)

Apologies

Larry Kelly (Gumbaynggirr Traditional Owners Group)
Roger Mehr (DECC)
Glen George (DWE)
Damien Grace (Commerce)
Vince Joseph (Commerce)

Actions.

	ACTION	By Who	By When
	Commerce to contact DECC (Parks and Wildlife) to determine if any areas have been registered as heritage sites.	TA	
	Commerce to find out if any heritage sites are listed in Council's Aboriginal Cultural Heritage Management Plan	TA	
	Commerce to find out if any heritage sites are listed by Bowraville Aboriginal Lands Council	TA	
	Bowraville Lands Council to be approached to register these two sites with DECC for future reference.	TA	
	Add the preparation of a "Cultural Heritage	TA	



	ACTION	By Who	By When
	Management Strategy" for this project to the EIS brief		
	Distribute the Shannon Creek CHMS to key community and absent committee members for review and comments.		Before next meeting
	Beryl Wilson will pass the Shannon Creek CHMS document on to the Local Aboriginal Land Councils at a regional Land Councils meeting on 4/6/08.		4/06/08
	Approach Bowraville Aboriginal Land Council about holding the next meeting at their offices	TA	21/07/08
	Commerce to provide update reports to Bowraville Local Aboriginal Land Council (Lloyd Lynwood) for reporting to ACAC	TA	Ongoing - before ACAC meetings

Close 12.00

Next Meeting

5 August '08

2008 Meetings Schedule:

5 August '08; 7 October '08; 2 December '08; 3 February '09



Nambucca District Water Supply Bowraville Off-River Storage

Aboriginal Liaison Committee Meeting # 5

MINUTES

DATE: Tuesday 5 August 2008
TIME: 10:30 a.m. to 12:00pm
LOCATION: Council Chambers, Macksville

Attendee's

Martin Ballangarry (Gumbaynggirr Traditional Owners Group, NSC Councillor)
Kevin Ballangarry (Gumbaynggirr Traditional Owners Group)
Caine Rosser (Unkya LALC)
Brian Flanders (Gumbaynggirr Traditional Owners Group)
Richard Spain (NSC).
Tim Alexander (Commerce)

Apologies

Paula Flack (NSC - Councillor)
Roger Mehr (DECC)
Glen George (DWE)
Damien Grace (Commerce)
Vince Joseph (Commerce)

Actions

	ACTION	By Who	By When
1	Find out if any heritage sites are listed in Council's Aboriginal Cultural Heritage Management Plan.	TA	13/08/08
2	Bowraville Lands Council to approach DECC to register these two sites.		
3	Aboriginal Heritage issues to be discussed and identified for presentation to the EIS consultants	MB, KB, BF, KR	07/10/08

Close 12.00

Next Meeting

7 October '08

2008 Meetings Schedule:

7 October '08; 2 December '08; 3 February '09



APPENDIX 2

DEPARTMENT OF COMMERCE 'WALK-THROUGH'



Email from Tim Alexander to Navin Officer Heritage Consultants

This is to confirm that the walk-through to investigate areas of significance to the Bowraville Aboriginal community within the proposed Bowraville Off-River Storage borefield investigation area took place on Wednesday 19 December 2007, attended by the following:

Mr. Larry Kelly Gumbaynggirr Traditional Owners Group Elder

Mr. Brian Flanders Bowraville Local Aboriginal Lands Council

Mr. Kevin Ballangarry Gumbaynggirr Traditional Owners Group Representative

Mr. Richard Spain Nambucca Shire Council Manager, Water and Sewer

Mr. Damien Grace Dept. Commerce, Environmental Officer

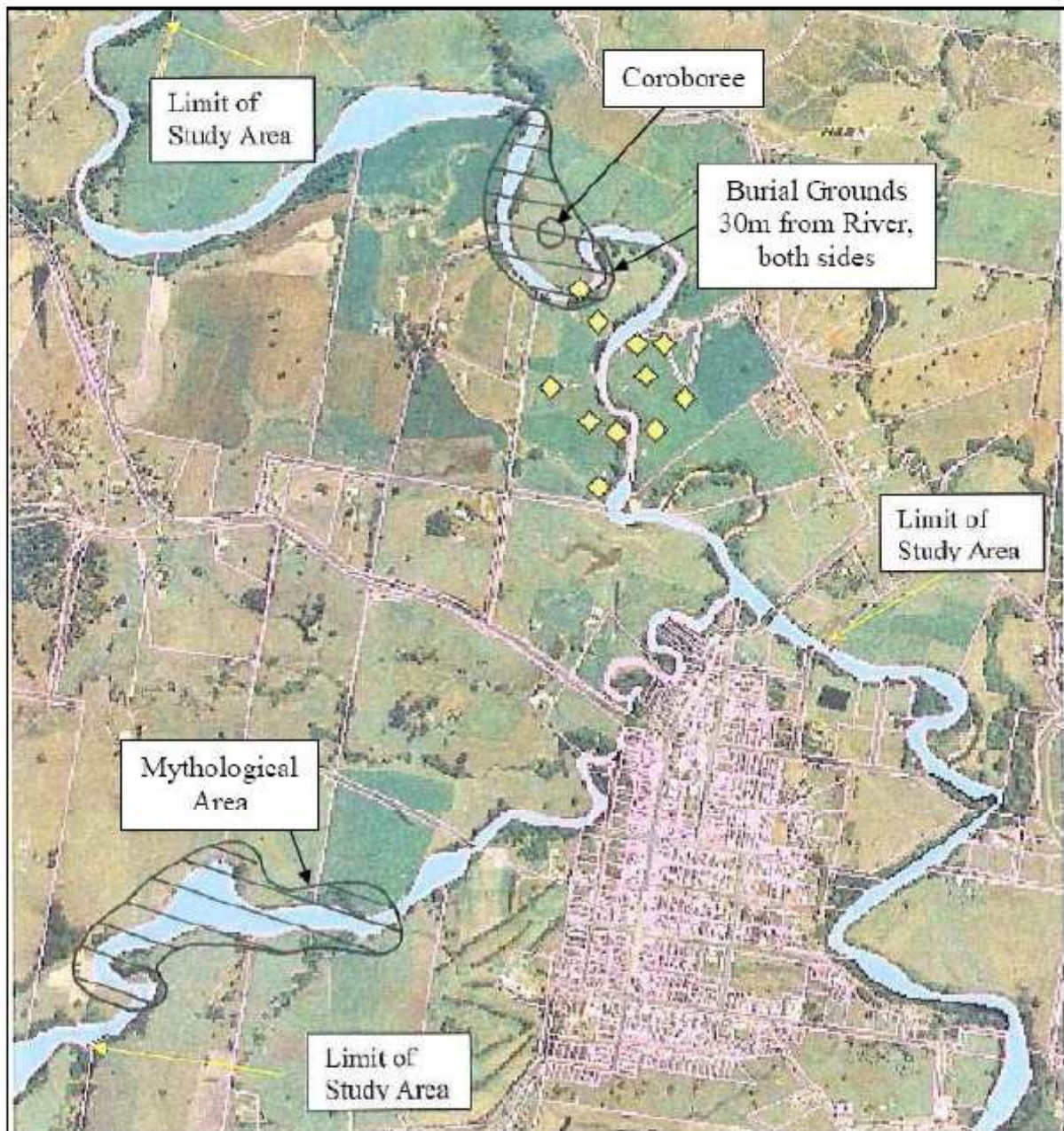
Mr. Tim Alexander Dept. Commerce, Consultant/Contracts Manager

Attached please find Drawing No. 5 showing the areas of significance identified on the walk-through.

These consisted of:

1. A Corroboree on the flat area on the inside of the bend in the Nambucca River on the S-W corner of property no. 13 (Usher).
2. Burial grounds adjacent to the river on both sides - up to 30m from the edge of the river - as shown hatched on properties 5, 10, 11, 12 and 13.
3. A Mythological Area adjacent to South Creek - up to 30m from the edge of the river - as shown hatched on properties 24, 25, 26, 27, 28.

Attached is also a drawing showing the borefield study area landowner properties.



Drawing No. 5: Borefield Study Area – Aboriginal Sacred Areas



APPENDIX 3

RECORD OF ABORIGINAL FIELD PARTICIPATION



Record of Aboriginal Representative Participation*

Project Name: Nambucca Water Env Assessment

Name(s) of Aboriginal Representative: Kevin Ballangarry (Porkey)

Name of Aboriginal Organisation: Bowraville Local Aboriginal Land Council

Archaeologist: Nicola Hayes & Deirdre Lewis-Cook

address: Navin Officer Heritage Consultants Pty Ltd

4/71 Leichhardt Street, KINGSTON, ACT 2604

ph: (02) 6282 9415; fax: 62829416

Client name: GHD

Shaun Lawer, Senior Planner

2/115 West High Street, Coffs Harbour NSW 2450

ph: (02) 6650 5600; fax: (02) 6652 6021

(please send your invoice to this address)

- Type of participation:
- ☐ Guided inspection of study area and sites
 - ☒ Accompanied/participated in archaeological survey/salvage
 - ☐ Separate inspection or survey
 - ☐ Accompanied/participated in excavation program

Period of participation:

Date(s)	Start	Finish
2/12/08	11.0am	1pm
3/12/08	8.00am	12.30pm
4/12/08	8.00am	11.5am

Comments: Comments noted.

Signed (archaeologist): N. Hayes

Signed (Aboriginal representative(s)): K. Ballangarry

* Please note this form is not an invoice. For payment, please send an invoice from your organisation to the client name and address provided above.



APPENDIX 4

STATUTORY AND POLICY CONTEXT¹

¹ The following information is provided as a guide only and is accurate to the best knowledge of Navin Officer Heritage Consultants. Readers are advised that this information is subject to confirmation from qualified legal opinion.



A4.1 National Parks and Wildlife Act 1974

The rationale behind the *National Parks and Wildlife Act 1974* (NP&W Act) as amended is the prevention of unnecessary or unwarranted destruction of Aboriginal Objects, and the active protection and conservation of Aboriginal Objects that are of high cultural significance.

With the exception of projects subject to the provisions of Part 3A of the EP&A Act, the NP&W Act (as amended) provides the primary basis for the legal protection and management of Aboriginal sites within NSW. The implementation of the Aboriginal heritage provisions of the Act is the responsibility of the Department of Environment and Climate Change (DECC).

The following summary is based on:

- The provisions of the current *National Parks and Wildlife Act 1974* (NP&W Act) as amended; and
- Department of Environment and Climate Change (DECC) policy as presented in the 1997 Standards and Guidelines Kit for Aboriginal Cultural Heritage provided by the (then) NSW NPWS, and as communicated orally to the consultants on a periodic basis.

The guideline documents presented in the 1997 Standards and Guidelines Kit were stated to be working drafts and subject to an 18 months performance review. The Standards Manual was defined not to be a draft and subject to periodic supplements.

An Aboriginal object is defined as:

'any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains.' [s5(1)].

In practice, archaeologists use a methodology that groups 'Aboriginal objects' into various site classifications according to the nature, occurrence and exposure of archaeological material evidence. The archaeological definition of a site may vary according to survey objectives; however a site is not recognised or defined as a legal entity in the Act. It should be noted that even single and isolated artefacts are protected as Aboriginal objects under the Act.

The investigation, use or destruction of Aboriginal objects is managed through a system of Aboriginal Heritage Impact Permits under the provisions of s87 and s90 of the Act. Section 87 relates to actions which do not involve direct damage to Aboriginal objects, and s90 relates to damage or defacement of Aboriginal objects.

Under s87 of the Act, it is an offence to do any of the following without a Permit from the Director-General of the DECC: disturb or excavate any land for the purpose of discovering an Aboriginal object; disturbing or moving an Aboriginal object; take possession of or removing an Aboriginal object from certain lands; and erecting a building or structure to store Aboriginal objects on certain land (s86). The maximum penalty is \$11,000 for individuals and \$22,000 for corporations.

Under s90 of the Act, a person who, without first obtaining the consent of the Director-General knowingly destroys, defaces or damages, or knowingly causes or permits the destruction or defacement of or damage to, an Aboriginal object or Aboriginal Place is guilty of an offence against the Act.

Where salvage actions (such as collection or re-positioning) are proposed in conjunction with an application to destroy Aboriginal objects, then an application for a s87 permit must accompany the s90 application. This is because a consent issued solely under s90 of the Act is not considered to permit actions other than those which destroy, deface or damage Aboriginal objects.

In January of 2005, the DECC introduced *Interim Guidelines for Aboriginal Community Consultation* with regard to the preparation of applications for a consent or permit under Part 6 (s87 and s90) of the NP&W Act. The Interim Guidelines include a required process of notification of intended



applications in the local media, an invitation for stakeholder groups to register interest, and various time periods providing an opportunity for registered stakeholders to comment and review proposed methodologies and assessments.

It should be noted that s75U of the EP&A Act (as amended) establishes an exemption to the application of s87 and s90 of the NP&W Act. It states that a Permit under s87 or a consent under s90 of the NP&W Act is not required for an approved project subject to the provisions of Part 3A of the EP&A Act. Section 75U also extends this exemption to include 'any investigative or other activities that are required to be carried out for the purpose of complying with any environmental assessment requirements under this Part in connection with an application for approval to carry out the project or of a concept plan for the project' (s75(U)4 EP&A Act 1979 (as amended)).

Section 175B of the NP&W Act outlines circumstances where corporation directors may be taken to have contravened these provisions, based on the acts or omissions of that Corporation.

The processing and assessment of permit and consent applications is dependent upon adequate archaeological review and assessment, together with an appropriate level of Aboriginal community liaison and involvement (refer Standards for Archaeological Practice in Aboriginal Heritage Management in 1997 NPWS Standards and Guidelines Kit).

The Minister may declare any place which, in his or her opinion, is or was of special Aboriginal significance with respect to Aboriginal culture, to be an Aboriginal place (s84). The Director-General has responsibility for the preservation and protection of the Aboriginal place (s85). An area declared to be an Aboriginal place may remain in private ownership, or be acquired by the Crown by agreement or by a compulsory process (s145).

The Director General may make an interim protection order and order that an action cease where that action is, or is likely to, significantly affect an Aboriginal object or Aboriginal place. Such an order is current for 40 days (s91AA, Schedule 3[10]). Such an order does not apply to certain actions, such as where they are in accordance with development consents or emergency procedures.

General Management Constraints and Requirements

Except where a project is subject to the provisions of Part 3A of the EP&A Act, the NP&W Act, together with the policies of the DECC provide the following constraints and requirements on land owners and managers:

- It is an offence to knowingly disturb an Aboriginal object (or site) without an appropriate permit or consent (s87 and s90);
- Prior to instigating any action which may conceivably disturb an Aboriginal object (this generally means land surface disturbance or felling of mature trees), archaeological survey and assessment is required (refer Standards for Archaeological Practice in Aboriginal Heritage Management in 1997 NPWS Standards and Guidelines Kit);
- When the archaeological resource of an area is known or can be reliably predicted, appropriate landuse practices should be adopted which will minimise the necessity for the destruction of sites/Aboriginal objects, and prevent destruction to sites/Aboriginal objects which warrant conservation (refer Standards for Archaeological Practice in Aboriginal Heritage Management in 1997 NPWS Standards and Guidelines Kit) and
- Documented and appropriate consultation with relevant Aboriginal Community representatives is required by the DECC as part of the prerequisite information necessary for endorsement of consultant recommendations or the provision of consents and permits by the DECC (refer Standards for Archaeological Practice in Aboriginal Heritage Management in 1997 NPWS Standards and Guidelines Kit).



Statutory Constraints Arising from Artefacts which Constitute Background Scatter

Background scatter is a term used generally by archaeologists to refer to artefacts that cannot be usefully related to a place or focus of past activity. There is no single concept for background 'scatter' or discard, and therefore no agreed definition. The recognition of background material within a particular study area is dependent on an appreciation of local contextual and taphonomic factors. Artefacts within a 'background' scatter can be found in most landscape types and may vary considerably in density.

Standard archaeological methodologies cannot effectively predict the location of individual artefacts within background scatters. Surface survey may detect background material either as individual artefacts ('isolated finds'), or even as small, low-density 'sites'. Subsurface testing may sample, and through analysis, characterise background material. However, beyond the scope of archaeological sampling, the potential to encounter background artefacts within the context of development related ground disturbance will always remain.

Most previous cultural resource management archaeological methodologies have acknowledged that there is little scientific justification for the conduct of archaeological salvage or ground disturbance monitoring to effect the recovery of background artefacts. The intrinsic scientific value of any recovered artefacts does not, in general, outweigh the expense of conducting the monitoring. However, low density distributions of artefacts are a current subject of interest by some heritage practitioners and DECC policy regarding this issue may change in the future. The monitoring of construction related ground works by Aboriginal groups is now increasingly practiced. The recovery of background scatter artefacts is often a probable outcome of such monitoring exercises.

Given the nature of statutory and DECC policy requirements in NSW, the detection of background artefacts during monitoring can be problematic. Except where a project is subject to the provisions of Part 3A of the EP&A Act, or where an Aboriginal object is covered by a current Aboriginal Heritage Impact Permit from DECC, all further impact to an Aboriginal object detected during development works, and to the ground in its immediate vicinity, must cease until an appropriate Permit or Consent is gained. It may take up to eight weeks for this to occur. However, in the past the DECC has not as a general rule granted consents to cover artefacts within background scatters which remain undescribed and undetected. This is because the DECC sought to provide consents where the significance and location of the Aboriginal objects to be impacted could be reliably defined. By their very nature, this may not be possible for artefacts that constitute a background scatter.

The present application of policy of the DECC does not provide for a consistent or proactive means of dealing with the statutory constraints posed by the detection of background scatter artefacts during development works. In those cases where the provisions of Part 3A of the EP&A Act do not apply, an option is the provision by the DECC of a s87 Permit or s90 Consent which includes all Aboriginal objects situated within the defined development site rather than specific sites or finds within it. This approach has been adopted by some DECC branch jurisdictions where an assessment has been provided which suitably investigates the known and predicted incidence of Aboriginal objects potentially subject to disturbance. Other DECC jurisdictions do not accept this approach and only provide permits and consents for known and defined Aboriginal object occurrences.

It should therefore be noted, that in the event that an Aboriginal artefact ('Aboriginal object') is detected during ground disturbance within a development study area, and that area or Aboriginal object is not covered by an AHIP, there may be considerable delays to development works while an application for a Consent to Destroy is processed.

A4.2 National Parks and Wildlife Amendment Act 2001

Although this Act was passed by both houses of the NSW parliament in 2001, a number of its provisions with regard to Aboriginal cultural heritage have yet to be gazetted and are not yet law. These include the following provisions:

- The requirement for a section 90 'Consent to Destroy' from the Director General would be replaced by a 'heritage impact permit' (Schedule 3[1], 3[3-8]);



- The offence under section 90 of the Principal Act of 'knowingly' destroying, defacing or damaging Aboriginal objects and Aboriginal Places without Consent would be changed so that the element of knowledge will be removed (Schedule 3 [2]). The amended section 90, subsection 1 would read:

'A person must not destroy, deface, damage or desecrate, or cause or permit the destruction, defacement, damage or desecration of, an Aboriginal object or Aboriginal place.'

- Section 90 subsection 1 would not apply when an Aboriginal object or Aboriginal place is dealt with in accordance with a heritage impact permit issued by the Director-General (Schedule 3[3], Section 90(1B) in amended Act);
- It would be a defence to a prosecution for an offence against subsection 1 if the defendant shows that:
 - (a) 'he or she took reasonable precautions and exercised due diligence to determine whether the action constituting the alleged offence would, or would be likely to, impact on the Aboriginal object of Aboriginal place concerned, and
 - (b) the person reasonably believed that the action would not destroy, deface, damage or desecrate the Aboriginal object or Aboriginal place.' (Schedule 3[3], Section 90(1C) in amended Act)
- A court would be able to direct a person to mitigate damage to or restore an Aboriginal object or an Aboriginal place in appropriate circumstances when finding the person guilty of an offence referred to in section 90 of the Principal Act (Schedule 3[9]); and
- Schedule 4[8] of the Bill provides for the Director-General to withhold in the public interest specified documents in the possession of the DECC which relate to the location of Aboriginal objects, or the cultural values of an Aboriginal place or Aboriginal object.

A4.3 NSW Heritage Act 1977

Overview

The purpose of this Act is to ensure that the heritage of New South Wales is adequately identified and conserved. In practice the Act has focused on items and places of non-indigenous heritage to avoid overlap with the NP&W Act, which has primary responsibilities for nature conservation and the protection of Aboriginal relics and places in NSW.

The *Heritage Amendment Act 1998* came into effect in April 1999. This Act instigated changes to the NSW heritage system, which were the result of a substantial review begun in 1992. A central feature of the amendments was the clarification and strengthening of shared responsibility for heritage management between local government authorities, responsible for items of local significance, and the NSW Heritage Council. The Council retained its consent powers for alterations to heritage items of state significance.

The Heritage Act is concerned with all aspects of conservation ranging from the most basic protection against damage and demolition, to restoration and enhancement. It recognises two levels of heritage significance – State and Local significance across a broad range of values. Some key provisions of the Act are:

- The establishment and functions of the Heritage Council (Part 2);
- Interim heritage orders (Part 3), the State Heritage Register (Part 3A);
- Heritage Agreements (Part 3B);
- Environmental planning instruments (Part 5);
- The protection of archaeological deposits and relics (Part 6); and



- The establishment of Heritage and Conservation Registers for state government owned and managed items (Part 7).

Generally this Act provides protection to items that have been identified, assessed and listed on various registers including State government section 170 registers, local government Local Environmental Plans and the State Heritage Register. The Interim Heritage Order provisions allow the minister or his delegates (local government may have delegated authority) to provide emergency protection to threatened places which have not been previously identified.

In addition, the Act includes provisions which relate to the definition and protection of relics.

Protection of Relics and Archaeological Deposits

Section 139 of the Act specifically provides protection for any item classed as a relic. A relic is defined as "...any deposit object or material evidence -

- (a) Which relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement; and
- (b) Which is 50 or more years old."

(Heritage Act 1977, Part 1, Section 4)

Section 139 of the Act disallows disturbance of a relic unless in accordance with an 'excavation permit' from the Heritage Council. This section also allows the Heritage Council to create exceptions to the requirement for an excavation permit with respect to certain types of relic, contexts, or types of disturbance (refer below).

Section 146 of the Act requires that the discovery of a previously unknown relic be reported to the Heritage Council within a reasonable time of its discovery.

Current policy and interpretation by the NSW Heritage Office (Department of Planning) limits the scope of the 'relic' definition to exclude above ground structures and a range of ground features or 'works' which may include roads, embankments and other forms of constructed ground relief. This interpretation is based on the definition of 'environmental heritage' in Section 4 of the Act which states that environmental heritage means 'those places, buildings, works, relics, moveable objects and precincts, of State or Local significance'. The Heritage Office interprets each of these categories to be mutually exclusive (correspondence from Reece McDougall, Executive Director, Dept of Planning, to K. Officer, Navin Officer Heritage Consultants 30/5/07).

Permits and Approval Requirements

The Act includes two key approval requirements

- A permit must be obtained for works which have the potential to interfere with a heritage item or place which is either listed on the State Heritage Register or the subject of an interim heritage order (s57); and
- A permit must be obtained to disturb or excavate land where it is known (or there is reasonable cause to suspect) that such action will or is likely to uncover or affect a relic (s139). This permit is known as an excavation permit and can be applied for under section 140 of the Act. Current interpretation of the Act by the Heritage Office indicates that excavation permits are only applicable to relics which are situated below the ground surface.

It should be noted that section 75U of the EP&A Act establishes an exemption to the requirement for an excavation permit. It states that an approval under Part 4 or an excavation permit under s139 of the Heritage Act is not required for an approved project subject to the provisions of Part 3A of the EP&A Act. Section 75U also extends this exemption to include 'any investigative or other activities that are required to be carried out for the purpose of complying with any environmental assessment requirements under this Part in connection with an application for approval to carry out the project or of a concept plan for the project' (s75(U)4 EP&A Act 1979 (as amended)).



Exemptions for works requiring Heritage Council Approval

Certain activities which may be conducted on heritage item listed on the State Heritage Register are exempted from the s57 approval requirements. Such exemptions are granted by the Minister and fall into two groups, standard exemptions and site specific exemptions.

A schedule of s57 standard exemptions has been formulated which includes activities such as certain types of maintenance and repair, minor excavations, changes of use, some temporary structures and 'anything which in the opinion of the Director is of a minor nature and will not adversely affect the heritage significance of the item'. In many cases notification of such proposed activities must be made by the applicant to the Director, and written notification from the Director received regarding his satisfaction that the exemption criteria have been met.

Exceptions from Excavation Permit Requirements

Certain activities are excluded from the s139 permit approval requirements. A series of exceptions have also been established for s139 Permit approval requirements. This includes demolition and maintenance of bridges not listed on the State Heritage Register, some forms of excavation and maintenance of underground services, conservation and repair of monuments and grave markers, and the exposing of survey marks in the course of survey operations.

On the 5 March of 2003, the following s139 exceptions were notified:

Excavation or disturbance of the following land does not require an excavation permit under s139, provided that the Director is satisfied that the criteria in (a), (b) or (c) have been met and the person to undertake the excavation or disturbance has received a notice advising that the Director is satisfied:

- (a) Where an archaeological assessment has been prepared in accordance with Guidelines published by the Heritage Council of NSW which indicates that there is little likelihood of there being any relics in the land or that any relics in the land are unlikely to have State or local heritage significance;
- (b) Where the excavation or disturbance of land will have a minor impact on the archaeological resource; and
- (c) Where the excavation or disturbance of land involves only the removal of fill which has been deposited on the land.

A person proposing to excavate or disturb land according to the above criteria must write to the Director and describe the proposed excavation or disturbance and set out why it satisfies the criteria. The Director shall notify the applicant if he or she is satisfied that one or more of the criteria have been met.

The Heritage Council of NSW

The role of the Heritage Council is to provide the Minister with advice on a broad range of matters relating to the conservation of the heritage of NSW. It also has a role in promoting heritage conservation through research, seminars and publications. The membership of the Heritage Council is designed to reflect a broad range of interests and areas of expertise.

Interim Heritage Orders

Under the provisions of Part 3 of the Act, the Minister can make an interim heritage order (IHO). A recommendation with respect to an order can come from the Heritage Council, either based on a request for the Minister, or the Council's own considerations. The Minister can also authorise Local Councils to make IHOs within their area. An interim conservation order may remain in force for up to 12 months, until such time as it is revoked or the item is listed on the State Heritage Register. A heritage order may control activities such as demolition of structures, damage to relics, places or land, development and alteration of buildings, works or relics.



The State Heritage Register

Changes to the Heritage Act in the 1998 amendments established the State Heritage Register which includes all places previously protected by permanent conservation orders (PCOs) and items identified as being of state significance in heritage and conservation registers prepared by State Government instrumentalities. Sites or places which are found to have a state level of heritage significance should be formally identified to the Heritage Council and considered for inclusion on the State Heritage Register.

Heritage Agreements

Under s39 of the Act, the Minister can enter into an Agreement with the owner of a heritage item listed on the State Heritage Register to ensure its conservation. Such an Agreement can cover a range of responsibilities including financial or specialist assistance and can be attached to the title of the land.

Environmental Planning Instruments

Part 5 of the Act gives the Heritage Council the authority to request that an environmental planning instrument be prepared covering certain lands. It also directs that the Heritage Council shall be consulted by others when preparing a draft planning instrument affecting land to which an interim heritage order applies or which includes an item listed on the State Heritage Register. In addition it gives the Heritage Council the authority to produce guidelines for the preparation of such planning instruments.

Heritage and Conservation Registers

Section 170 of the Act requires all state government instrumentalities to establish and maintain a Heritage and Conservation Register that lists items of environmental heritage. The register is to include items which are, or could potentially be, the subject of a conservation instrument, and which are owned, occupied or otherwise under the control of that instrumentality.

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Appendix F

Traffic Impact Assessment



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Nambucca Shire Council

Bowraville Off-River Storage & Associated Works

Traffic Impact Assessment

February 2009

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Executive Summary

The construction of the proposed Bowraville Off-River Storage within the Viewmont State Forest area will result in a number of potential traffic impacts on the local area. The anticipated impacts have been assessed for the two main alternative routes to the site in the Bowraville area, being either via Bellingen Road or Valla Road.

This report examines the options for access to the dam site and associated facilities as well as the anticipated traffic routes from Macksville to Bowraville. The largest contributor to traffic generated during the construction phase of the project will be from site workers and deliveries of select embankment materials that are not available on site. Site investigations have indicated that general bulk embankment materials area available on site. The report examines potential supply routes for the various materials and the suitability of connecting roads.

The final choice of access route to the storage site appears to be constrained by physical restrictions to the western access from Bellingen Road and the apparent need to provide an access connection to Valla Road on the eastern side in order to maintain legal access to otherwise landlocked private lands. The eastern access route will also need to be carefully located to minimise potential environmental impacts.

The consideration of impacts resulting from traffic generation during construction activities has found that during the short construction phase that the increase over existing traffic levels is relatively quite significant. However, the increased traffic density falls short of traffic threshold levels above which analysis of intersections would be carried out to determine anticipated delays and Levels of Service. Consequently, all affected intersections in the Bowraville area are expected to continue to perform satisfactorily from a traffic management point of view, during the construction period despite the increased traffic loading.

Following construction, the ongoing traffic generated by maintenance and potential tourist attraction is considered to be insignificant.

No features of the road network in the Bowraville area have been identified as having the potential to prevent access for construction or maintenance of facilities associated with the storage, Headworks or borefield areas.

1. Introduction

1.1 Project Background

GHD was commissioned by Nambucca Shire Council (NSC) to undertake a Traffic Impact Assessment as part of an Environmental Assessment for the proposed construction and operations of the Bowraville Off-River Storage Works.

The Bowraville Off-River Storage Works involves the construction of an off-river water storage on the headwaters of Bowra Creek, expansion of the existing borefield along the Nambucca River and South Creek, construction of new collection tanks and high lift pumping station, and installation of approximately 1,500 to 2,000 m of pipeline to connect the collection tanks to the proposed off-river storage along with other related roads and power infrastructure.

The main objective of the Bowraville Off-River Storage Works is to increase the capacity of water storage to meet future population growth and demand.

1.2 Purpose of Report

This traffic study report has been prepared by GHD Pty Ltd (GHD) to address the overall traffic impact from the proposed development of the Off-River Water Supply Storage located on Bowra Creek approximately 2.5 km northeast of Bowraville.

The expected location of the Off-River Storage in relation to Bowraville, together with options for pipeline routes and access roads is shown in Appendix A.

A Traffic Impact Assessment (TIA) is required as part of the Environmental Assessment for the Part 5 Application under the Environmental Planning and Assessment Act 1979 (EP&A). It will assess the traffic impacts of the proposed Off-River Storage and associated activities. The TIA will be a specialist component of the Environmental Impact Assessment (EIA) being prepared by GHD. The traffic volumes projected to result from the development will also be used to generate traffic related noise impacts to be documented in the separate Noise Study.

The report will document anticipated activities associated with:

- ▶ The investigation and construction phase covering the expansion of the borefield, construction of the new storage and pipelines and water treatment plant known as the "Headworks";
- ▶ The operational phase of the new facilities to follow after commissioning of the extraction, storage and delivery works.

The fundamental approach of a traffic impact assessment is to establish the traffic generation resulting from the operation of a new development. Usually, the construction phase has a lesser and shorter term impact than the longer term use of a development. In this case, the construction phase is being assessed, as the construction activities are significant in the overall context.



1.3 Scope of Investigations

This Traffic Impact Assessment has been prepared in accordance with the requirements of NSC and the RTA *Guide to Traffic Generating Developments* (October 2002). The study will include the following:

- ▶ Impact of additional traffic on the capacity of the local road network during the construction and operational stages of the proposed development especially with respect to capacity and safety;
- ▶ Assessment of the intersection performance of the following road junctions with respect to safety and performance:
 - MR 118 Rodeo Drive and Pacific Highway intersection;
 - MR 118 Rodeo Drive and Valla Road intersection; and
- ▶ Review of access arrangements in terms of safety for a number of minor intersections anticipated to be utilised as part of the total works;
- ▶ Assessment of the routes to access the dam site with respect to safety and the potential demand for parking and car parking arrangements;
- ▶ A review of existing regulatory signage and line marking in the vicinity of the site and identification of any need for modification as a result of the development;
- ▶ Visual assessment of the pavement condition and road geometry on MR 118 Rodeo Drive;
- ▶ Comment on the impact to public transport including school bus services, cyclists and pedestrians, if any;
- ▶ Assessment of identified deficiencies anticipated in the road network in relation to road safety and amenity; and
- ▶ Recommendation of strategies or works considered necessary to maintain acceptable levels of road safety and amenity in relation to the expected increase in traffic resulting from the proposed works.

1.4 Consultation with government bodies

In order to fully understand local road conditions, apart from physically viewing the site and traffic conditions it is necessary to inquire with relevant authorities that have an existing understanding and knowledge of the road network. Matters to be considered include:

- ▶ Traffic count data;
- ▶ Motor vehicle crash data;
- ▶ Network performance data;
- ▶ Public and school bus service information;
- ▶ Future planned works and network changes;
- ▶ Existing road and traffic audit data; and
- ▶ Information in relation to traffic accident blackspots.

Roads and Traffic Authority (Grafton Region)

Initial traffic count data and motor vehicle crash data was obtained from the RTA web site and also from direct inquiry with the RTA.

Due to the relatively low potential impacts arising from the construction phase of the project and the much lower ongoing traffic impacts expected to arise following commissioning it was considered that direct consultation with the RTA would not be offer additional information that was not already generally available.

Nambucca Shire Council

An initial request for information (RFI) was also submitted to NSC to provide information in relation to the listed points above.

NSC provided existing traffic count information for Bellingen Road which passes to the west of the dam site. The traffic data is included in Appendix B. A summary of the response is included in Section 3.1.1. Engineering staff have also provided further information in regard to property and access matters around the dam site.

Lands Department Coffs Harbour and Grafton

Inquiries have been made to the Lands Department to provide advice in relation to the status of roads being either Crown or Public roads and also in relation to the status of roads following NSC's acquisition of part of the Viewmont State Forest for the dam and storage site. The department's advice is contained in following sections dealing with access to the dam site. A copy of the advice from the Lands Department is contained in Appendix E.

1.5 Council Planning Requirements

There are four planning instruments that are considered to be relevant to the proposal.

State Environmental Planning Policy (Infrastructure) 2007

The SEPP contains requirements for assessment of developments of a significant nature in relation to traffic generation, parking and access as well as proximity to a classified road. In terms of traffic generation and parking requirements this proposal does not meet the minimum criteria of the SEPP for referral to the RTA or consideration by the Local Traffic Committee.

Nambucca Shire Local Environment Plan 1995

No specific requirements are considered to be applicable to the proposed development. However, NSC has a general requirement to consider the adequacy of public roads and bridges serving the land in relation to the additional traffic likely to be generated by the development.

Nambucca Shire Council DCP1 – Off Street Parking

The proposed activity does not meet the nominated categories of the plan. The closest similar activity would be Extractive Industry which may have relevance to the construction activities required where the parking requirement is;

- ▶ 1 per company vehicle
- ▶ + 1 per 2 employees
- ▶ + 1 per dwelling.



Other requirements with respect to bicycle parking and parking for disabled persons are not considered to be required.

Parking requirements for the post construction tourist or viewer attraction to the site will be mainly determined by the site facilities to cater for casual visitors to the site and the features of the site which would prove attractive to casual visitors.

Nambucca Section 94 Contribution Plan – Mines and Extractive Industries

The purpose of the plan is to levy contributions to enable NSC to undertake roadworks to maintain the road network damaged by the haulage of materials from mines and extractive industries.

Construction of the storage will involve activities similar to an extractive industry by way of winning materials on site to construct the dam wall. However, the materials will be used on site and will not be hauled over public roads. Hence, the works will not fall within the ambit of the contribution plan.

It is expected to be necessary to buy materials from off site which are captured by the plan. Consequently, a portion of that cost will be payable by the provider for the maintenance of the road network. The purchase of sand, gravel, rock and ready mixed concrete are expected to include components which fall within the contributions plan.

2. Proposed Development

2.1 General Description

The proposed development involves constructing;

- ▶ An off river storage dam;
- ▶ Storage inlet works and control valves etc;
- ▶ Upgraded access road to the dam site;
- ▶ Dam access, maintenance, car parking and viewing areas;
- ▶ Pipeline connecting the dam to the existing Headworks adjacent to the existing borefield;
- ▶ Extended borefield and connecting pipeworks to the Headworks.

2.2 Access to Dam Site

Currently three alternative routes are available to gain access to the dam site. The alternatives are shown in the concept plan and the copies of DP 1076377 and DP 1092320, all attached in Appendix A.

Road A is the eastern access road off Valla Road and Road B is the western access road off Bellingin Road. In the previous discussion of investigations into the local road network roads A and B are referred to as the eastern and western ends of the East-West Link Road which is currently classified as a Crown Road.

The third access route is a 10m wide Right of Carriageway (ROC) created over Pt 5 in DP 1076377. The ROC has a length of 935m from Bellingin Road to the northwestern corner of Lot 6 which is owned by NSC as part of the storage site. The route of the ROC generally follows the existing track to the house on Pt 5 owned by Ussher. Beyond the house the ROC appears to be unformed. Due to the limited width of the ROC it appears that it was acquired in order to provide access for occasional maintenance. For construction of the dam a wider road reserve is required in order to provide access for two way traffic by heavy vehicles.

Consequently, no further consideration will be given to use of the ROC for access to the dam site for general construction activities.

2.3 Preferred Access Route to the Dam Site

2.3.1 Eastern Access Route from Valla Road

The shortest route to the dam site is from Valla Road along the existing Crown Road Reserve to an area which could be used as a public viewing and turning circle approximately 900m from Valla Road. Advice received from the Department of Lands indicated that it would be expected that NSC would acquire all of the Crown Roads within the area of the State Forest to be purchased by NSC. The letter contained in Appendix E details the process NSC will need to follow in any application to the Lands Department to acquire the road.



Following acquisition, NSC would be expected to dedicate the dam access road as a public road. It appears that NSC would be obligated to dedicate the access road to the public as it appears that a ROC created under DP 1092320 relies upon the existing Crown Road to provide legal access to Lot 2 DP 1076377 which would otherwise be landlocked. The ROC joins the Crown Road at the eastern boundary of Por 183 approximately 720m from Valla Road. The upgraded access road for public access could be terminated at this point and an "internal" access provided for maintenance purposes beyond this point to the dam infrastructure.

A preliminary design has been completed for upgrading of the existing Crown Road as it is currently unsuitable for a higher level of use. The design indicates that the characteristics of the road would be as follows:

- ▶ Length from Valla Road to turning circle = 900m
- ▶ Road formation width = 6m, containing 3m bitumen seal;
- ▶ Maximum longitudinal grade = 9%;
- ▶ Average total width including cut and fill batters = 22m;
- ▶ Maximum width of formation for roadway including cut and fill batters = 30m;
- ▶ Parking and turning area approximately 100m x 25m;

The preliminary access road design continues past the viewing area to a point below the dam embankment approximately 1,900m from Valla Road. It is assumed that NSC would install security gates at the end of the viewing area (Ch 1040) to restrict public access. At Ch 1300 provision has been made for connection directly to Lot 2 DP 1092320. This would permit the existing ROC to be expunged provided the property owner agreed and provision was made for the owner and visitors to traverse the "non-public" section from Ch 1040 to Ch 1300.

The ecological assessment of the vegetation along the route from Valla Road has identified a number of mature hollow bearing trees which provide high value habitat. These trees should be identified as part of the detailed design for the access upgrading. The ecological assessment should be referenced to determine appropriate location and construction details to be adopted for the upgraded access road.

2.3.2 Western Access Route from Bellingen Road

The alternative western access route from Bellingen Road at present is used for access to a dwelling on Lot 1 DP 1083234 which is approximately 500m from Bellingen Road. The road reserve follows the boundary of Lot 1 for 965m before turning northwards and easterly within Lot 1 to meet the boundary of land acquired by NSC being Lot 2. The additional length of roadway within the forest area on Lot 1 is approximately 450m. Immediately upon reaching the boundary of the dam site a 135° right turn is required to avoid the storage area and travel 200m south to the end of the Stage 2 embankment wall.

From an engineering perspective, it would appear that use of the Crown Road to access the dam site for construction would offer fewer environmental impacts as the surrounding forest area does not contain mature vegetation as it has been logged and replanted. The turn at the boundary of the dam site may prove to be an impasse due to the limited turning radius available based upon the anticipated area to be inundated if the Stage 2 embankment is constructed.

In addition, the limited area of land available is compounded by the steep slope of the area. Slopes of 25% appear to be typical in which it would be desired to construct the visitor and observation area. It would also have to be substantially within the area which would be inundated by the Stage 2 works. Consequently, due to the limited site area, and the need to construct a Crown Road which is currently not constructed or in use, the western access does not appear to be suitable for long term access to the dam site.

2.4 Access to the Headworks and Borefield

The current borefield is located in an area approximately 700m x 400m along Nambucca River approximately 1 km north of Bowraville. The borefield straddles both sides of the river. Vehicular access to the eastern side is via Bellingen Road to a laneway 750m north of High St and the Headworks is 200m west toward the river. The Headworks is adjacent to the existing borefield. A description and assessment of the existing access to the Headworks is included in section 3.2.4.

Access to the western side of the borefield is via High St, Lower North Arm Road and Borefield Road.

Five additional borefield aquifers have been identified to augment the supply to the storage. One is located partly on the eastern side of the existing borefield. Access to the enlarged borefield area would be via existing routes.

Two are located within 1.5 km north of the existing borefield on Nambucca River and would be accessed via Bellingen Road. If a permanent access to the northern area is proposed off Bellingen Road the access point on Bellingen Road should be assessed for sight distances in accordance with AS 2890.1 as for a property access.

Two borefields are located within 1.6 km south of the existing borefield along South Creek. Access to the southern borefield will be via High St and Lower North Arm Road to the western side of South Creek. A new access off Lower North Arm Road is also expected to be required and should meet sight distance requirements noted above.

2.5 Traffic Generation and Assignment

2.5.1 Traffic Generation

Activities associated with the project which will result in traffic generation include:

- ▶ Construction of the storage including construction workers and delivery of materials;
- ▶ Construction of connecting pipelines between the storage, borefields and water treatment plants and pumping stations;
- ▶ Establishment of new and extended borefields, and
- ▶ Installation and maintenance of supporting infrastructure, namely power supplies and telemetry facilities.
- ▶ Post construction public viewing of the storage.

A Traffic Impact Study normally examines the traffic implications resulting from the operation of a development. In this case, it is likely that the traffic generated by the use of the facilities into the future would be limited to maintenance of the borefield, pumpstations, pipelines and occasional inspection of the storage dam. Such traffic activities are expected to be barely perceptible in relation to the normal daily traffic activities in the area.

Consequently, it is proposed to examine the construction activities in more detail to ensure that any potential adverse effects are recognised and understood.

Given the anticipated scale of the proposed works it is considered that the storage would attract the highest number of construction workers, over the longest period of time, compared with the other activities. The other activities would also be undertaken over a diverse and changing area. Construction works would include logging and vegetation removal, winning of materials for the dam embankment, importation of embankment materials, embankment construction, pipelines and facilities for the pumped inflow and supply draw off. Works of this type are normally highly mechanised with a relatively low number of workers.

It is anticipated that the peak number of construction workers on the site at any one time would not exceed 30. This represents about 20 large plant items on site plus 10 supervisory and support staff.

The *RTA Guide to Traffic Generating Developments* does not provide any guidance on traffic generation that can be directly applied to works of this nature. An estimate of the traffic generation must be made from first principles. It will be assumed that all workers trips will be by car. There will also be a number of daily materials deliveries such as concrete trucks for the construction of control structures and rock and sand for the construction of the earthen embankment.

Table 1 Estimated Peak Daily Traffic Generation

Component	Daily Trips # (vpd)
30 Staff	60
Allowance for off site support trips	10
Materials deliveries @ 30 per day peak	60
Total	130

Trip: A one way vehicular movement from one point to another excluding the return journey. Therefore a vehicle entering and leaving a land use is counted as two trips.

2.5.2 Construction Materials

The primary needs for construction materials include:

1. Materials required for the storage embankment and control structures at the dam site;
2. Materials required for the construction of the pipeline from the Headworks to the storage;
3. Materials required for possible upgrading of the Headworks by the inclusion of water treatment and filtration as well as pumping and valves etc.

4. Materials required for the laying of additional rising mains from the new bores to the Headworks.

Items 1 and 2 above will be addressed below. Items 3 and 4 have not been developed at this time and will be addressed in the final report. A general overview of items 3 and 4 is presented below.

Item 3 will require a relatively small quantity of materials associated with the valving and pumping arrangements to connect the borefield to the main rising main and also for the connection of the gravity discharge from the storage to the reticulation. The potential impact of additional traffic will also be mitigated as the access to the site is via Bellingen Road and the existing Headworks site access.

Item 4 will also have a relatively small quantity of materials required over a large spread of area. The potential for traffic impacts are therefore, relatively minor and spread between numerous sites that are expected to be accessed via existing property accesses from either Bellingen Road or Lower North Arm Road.

Materials Required for the storage Embankment

It is understood that current site investigations are attempting to prove the existence of suitable construction materials for the storage dam from within the extent of the storage area. There is an obvious economic advantage as well as reduced transport costs if suitable materials to construct the earth filled embankment can be found within the site. Materials which are expected to be required would include clay soils, general fill, filter sand, gravels for aggregate and sound rock for armouring of the embankment to protect against erosion. In addition a comparatively small amount of concrete would be required for the construction of reinforced concrete structures. Possible supply sources for the various materials may include:

- ▶ Marriotts Quarry Valla (previously Monro Earthmoving, Rose Valley). – hard rock, armour rock through to sand.
- ▶ Nambucca Valley Gravel Pty Ltd, Pacific Highway, Macksville
- ▶ Raleigh Sands, 3 Valery Road, Raleigh – sand.
- ▶ Raleigh Co, Congarinni and Nambucca Heads
- ▶ Hy-Tec Readymix Concrete, 25 McKay St Macksville.
- ▶ Boral Concrete, Macksville Industrial Estate.

Preliminary dam design investigations for Stage 1 works, have indicated that the following quantities of materials may be required to construct the dam embankment. The quantities are in-situ compacted volumes.

- ▶ Rock armour 13,000m³;
- ▶ Filter sand 19,000m³;
- ▶ Clay core 60,000m³;
- ▶ Fill material 208,000m³;

Sources of materials to satisfy quality requirements are currently being investigated. It is expected that Marriotts Quarry and Raleigh Sands would be suitable sources of rip rap and filter



sand. Final selection would depend upon quality of materials and production and transport costs. Investigations within the area to be inundated are expected to prove that suitable clay and general fill can be sourced on site.

Both suitable hard rock and sand sources are expected to be located north of Nambucca Heads. It is anticipated that any supplier would not attempt to access the site through Valla via Valla Road to the eastern side of the dam site. This route is narrow, windy and mountainous and would be unsuitable for heavy vehicles.

For example if materials are supplied from Marriotts Quarry at Valla, the route would be 5km along Valla Road to Pacific Highway, then 15.8km along Pacific Highway from Valla Road to Rodeo Drive, 12.4km along Rodeo Dr and 2.5km along Valla Road to the access road. The total distance being 35.7km.

Alternatively, from Marriotts Quarry to Pacific Highway then via Old Coast Road at Nambucca Heads to Wirrimbi Road and then along Rodeo Drive to Valla Road and the site access road is a total distance of approximately 25km. Wirrimbi Rd is signposted at Rodeo Drive as the connection to Nambucca Heads. It is sealed for the full length and is commonly used by logging trucks and would be a suitable route to the site. Wirrimbi Rd has a timber bridge over the railway line about 400m from Old Coast Rd. The bridge is signposted with Load Limits of 20 tonnes for a rigid Single Unit Truck and 28 tonnes gross for a semi-trailer. If it is proposed to use truck and dog combination trucks on this route the bridge may have to be rated to suit the particular axle group combinations. Due to the narrow width of the bridge of 5.0m between timber kerbs the bridge is signposted for one way traffic movements and has Give Way control on the western or Bowraville approach side. Considering the directional flow of trucks to and from the dam site, loaded trucks will have right of passage and empty trucks will give way.

The primary supply route to the dam area for most materials is expected to be along Pacific Highway north and south of Macksville and via Rodeo Drive to Bowraville. If any local roads are identified by NSC as being possible supply routes which may have adverse road or environmental impacts then the consent authority has the ability to ban the use of certain routes through conditions of consent in order to control or regulate potential impacts to an acceptable outcome.

Regardless of which route or routes are used to travel to the Bowraville area from distant material sources, the last 2.5km of travel to the dam access road is along Valla Rd which is not sealed. Consequently, it is anticipated that the gravel surface will be subject to rapid deterioration under heavy traffic if not maintained during the course of the works. Heavy traffic will also generate dusty conditions which could be hazardous to other road users and a nuisance to adjoining property owners. In order to maintain safety for both the public and traffic associated with the dam construction, Valla Rd should be regularly graded and gravel re-sheeted as required during the work period. Dust management may be achieved by watering with or without the use of proprietary wetting and binding agents to reduce water usage. Alternatively, the entire 2.5km of the road could be upgraded and sealed. A Traffic Management Plan for the road should include defined maintenance intervention levels, standards to be maintained, guideposting and signage for the information of the public.

On the basis of average truck volumes and the required quantities of materials for the RL 39.5m dam height, the total number of deliveries is anticipated to be as set out in Table 2 below. The

table includes the daily total considered to be consistent with the capacity of the site operations to construct the dam embankment in place. It is expected that site works will include the winning and stockpiling of the clay core and general fill materials. Externally supplied materials are expected to be supplied in truck and dog combination vehicles with a capacity of say 20m³ or 32 tonnes. The site does not contain supplies of filter sand or hard rock for rip rap.

Table 2 Imported Dam Materials and Trip Generation

	Rip Rap	Filter Sand
Quantity Required (m ³)	13,000	19,000
Bulking Factor	1.15	1.20
Bulk Volume (m ³ on truck)	15,000	23,000
Truck and Dog Capacity	17m ³ /32t	23m ³ /32t
No of Loads	882	1,000
No of Weeks @ 15 loads per day, 6 days per week	10 weeks	11 weeks

Deliveries may overlap and run concurrently for at least part of the delivery phase of the project. This will result in 30 loads delivered to site each day and represents 60 trips to and from the site per day on top of normal construction activities. Assuming a 10 hour construction period each day and say 8 hours of cartage the hourly average is 7.5 trips per hour. Variations over an average day may result in hourly cartage ranging from 5 to 10 trips per hour.

Materials Required for the Rising Main Construction

Table 3 Pipeline Construction Materials and Trip Generation

	Option 6	Option 7
Route Length (m)	1670	1990
Backfill (m ³) at 0.4m ³ /m	628	796
Bulk Volume (1.20 factor)	755	955
Truck and Dog Capacity	20m ³ /32t	20m ³ /32t
No of Loads	38	48
No of Pipe Deliveries (120m per delivery)	13	17
Total No of Deliveries	51	65
Daily trips for deliveries over 6 weeks, 6 days per week.	1.4	1.8
Crew trips of 8 men @ 2.5 trips each	20	20
Total daily trips (rounded)	21	22



As at March 2009 pipeline route options 6 and 7 have been short listed for detailed evaluation. The materials required for each route option are set out in Table 3 above.

The route options are indicated in Appendix A and described as follows:

Option 6 - From the Headworks facility east to Bellingin Road, continues in a straight line along the access to property Lot 102 DP809380, crosses Bowra Creek to its eastern side, then follows the creek to the storage.

Option 7 - From the Headworks facility to the south and east across the flood plain and behind the 3 small lots on Bellingin Road, crosses Bellingin Road and follows the boundary between Lot 3 DP253386 and Lot 3 DP862561 until it crosses Bowra Creek, then follows the creek to the storage.

In both cases it is expected that Bellingin Road will be underbored to minimise disruption to normal traffic flow and to avoid the need to reinstate a trenched crossing of the road.

The table above detailing possible scenarios associated with supply of materials to enable construction of the rising main to the storage indicates that the heavy vehicle trips generated by the supply of materials comprises less than 10% of the total daily trips. More than 90% of the trips are light vehicles resulting from workers and supervisors.

It is also anticipated that all trips would be assigned to Bellingin Road as it is the closest main route to the route work areas. Access to the eastern side of Bowra Creek is expected to be facilitated by existing farm access crossings so that it will not be necessary to enter the works area from the storage site via Valla Road.

The average number of hourly traffic trips based upon a 10 hour day for both construction operations and supply of materials is approximately 2 per hour. The potential impacts are consequently considered to be quite minor.

2.5.3 Traffic Growth

Traffic associated with the construction phase of the project can not be assessed for growth due to its short term nature and variability within the construction phase.

The estimated 2019 traffic growth has been extrapolated from the data in Section 3.3. These figures provide a guide to what may occur in the future. It should be recognised that no modification of the data has been made to account for local planning strategies or possible future works such as the planned bypass of Pacific Highway to take it east of Macksville which will greatly reduce the loading on the current intersection of Pacific Highway and Rodeo Drive.

Table 4 Traffic Volumes Extended to 2019

Station	Location	AADT 2009	AADT 2019
09.244 and 09.213	Pacific Highway Macksville	19,950	27,100
09.347	Rodeo Dr Macksville	2,100	2,800
09.349	Bellingen Road south of High St	1,650	2,200
09.350	Bellingen Road north of High St	1,100	1,500

2.5.4 Traffic Assignment

The storage site will be accessed either via Valla Road or Bellingen Road from Bowraville. It is expected that the bulk of site workers and materials deliveries will be via Rodeo Drive between Macksville and Bowraville especially for vehicles originating from south of Macksville. This may constitute 90 to 95% of trip volume but may be reduced if deliveries are permitted to use the shorter route via Old Coast Road and Wirrimbi Road to Rodeo Drive.

The balance of trips may be in and out of Bowraville via High St and between Macksville and Bowraville via Wilson Road. Due to the location of the Hi-Tec Readymix Concrete plant in McKay St Macksville, any deliveries from this plant are expected to utilise Wilson Road to Bowraville. Deliveries from the readymix plant located in the Macksville Industrial Area south of the town would be most likely to use Rodeo Drive. The preference for Rodeo Drive could be made a requirement.

Other activities associated with the borefields and pipelines etc are expected to utilise Bellingen Road, Lower North Arm Road, Borefield Road and South Arm Road. Due to the minor and variable nature of potential minor activities, no attempt has been made to carry out a trip assignment for the associated activities.

The analysis provided in section 3.3 considers full traffic assignment to both Bellingen Road and Valla Road as alternative access routes to the storage site as well as the intersection of Valla Road and Rodeo Drive.

2.6 Sight Distances

2.6.1 Sight Distance Requirements

One of the critical issues relating to a proposed property access is whether it has sufficient horizontal and vertical sight distances with the existing intersecting road. The specific sight distance criteria used in this assessment has been derived from the Austroads *Guide to Traffic Engineering Practice, Part 5: Intersections at Grade* (2005) (GTIAG). Approach Sight Distance and Safe Intersection Sight Distance were measured from the proposed location of each access or existing significant intersection on the access route. Indicative sight distances for various design speeds are shown below in Table 5. They have been extracted from Table 6.3 of GTIAG. Adjustment must be made for the grade of the approach. Design speeds are usually



taken as the posted speed limit where environmental factors do not force a reduction. Otherwise the anticipated 85th percentile approach speed is taken as the design speed.

Approach Sight Distance (ASD)

ASD is the minimum level of sight distance that should be available at all intersections. It is the distance travelled by a vehicle between the time the driver receives a stimulus signifying a need to stop and the time the vehicle comes to rest. ASD is measured from a driver's eye height (1.05m) to 0.0m, which ensures that a driver is able to see any line marking and kerbing at the intersection.

Safe Intersection Sight Distance (SISD)

SISD provides sufficient sight distance for a driver of a vehicle on the major road to observe a vehicle from the property access that could potentially create a collision situation (e.g. in the worst case, stalling across the traffic lanes), and to react by decelerating to a stop before reaching the collision point. SISD is measured horizontally along the carriageway from the approaching vehicle to the conflict point, and vertically from the driver's eye height (1.05m) to driver's eye height (1.05m).

Table 5 Sight Distances for Level Grade

Design Speed	Approach Sight Distance - ASD		Safe Intersection Sight Distance – SISD	
	Minimum	Desirable	Minimum	Desirable
40 km/h	33m	39m	66m	72m
50 km/h	47m	54m	89m	96m
80 km/h	103m	114m	170m	181m
100 km/h	157m	170m	240m	253m

3. Existing Conditions

3.1 Site Description and Surrounding Land Uses

The proposed dam site is located approximately 17 kilometres north west of Macksville via Rodeo Drive and Bellinghen Road. The site is less than 3 km direct from Bowraville on Bowra Creek which is a tributary to Nambucca River.

From the intersection of Rodeo Dr with Bellinghen Road and Valla Road two alternative routes are available to the dam site, either Bellinghen Road or Valla Road. The location of the site in relation to Macksville is shown in Figure 1. The location of the dam site in relation to Bowraville is shown in Figure 3.



Figure 1 Site Location plan

Bowraville has a population of about 1,000 persons (ABS 2006). The surrounding area is used for forestry, rural production and hobby farms. The dam site is located in Viewmont State Forest, north of the village.

3.1.1 Information Provided by NSC

On 11 September 2008 a request for information was forwarded to NSC. The enquiry sought information relevant to the project including any NSC traffic counts, crash data, existing road network performance and bus service operations etc. In addition, identification of any known

local issues such as planned changes to road routes, route upgrades, road closures and other developments which might impact this traffic study were requested to be identified.

The reply received from NSC included:

- ▶ Traffic count data for Bellingen Road only, which is included in Appendix B;
- ▶ It was advised that no specific crash data was available from NSC and that no identified traffic black spots were known in the area;
- ▶ Some investigation has been completed into the possible modification of the intersection of Rodeo Drive and Bellingen Road, though the proposal is incomplete;
- ▶ The general view is that roads in the area function adequately and there are no plans for major improvements;
- ▶ Bus services are provided by Baldwins Bus Service and Busways North Coast Pty Ltd;
- ▶ There are no local issues known which might impact on the proposal, and
- ▶ NSC is not proposing to modify the road network, or knows of any new development in the area which might materially impact on the traffic study.

There was no traffic count data available for Valla Road.

3.2 Local Road Network

The key roads relevant to the site are shown in the figure below.

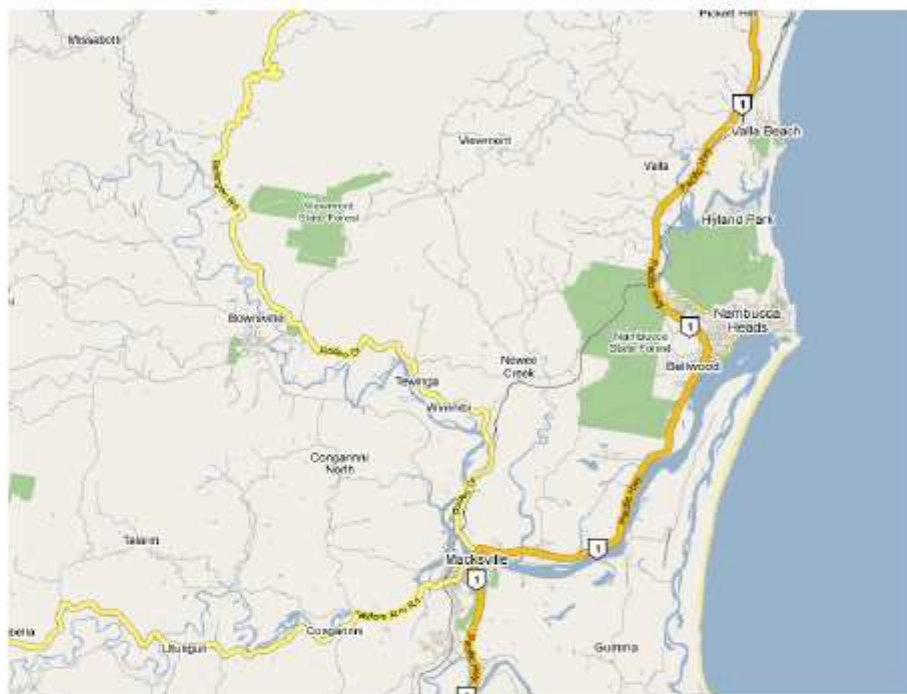


Figure 2 Key Regional Access Roads.

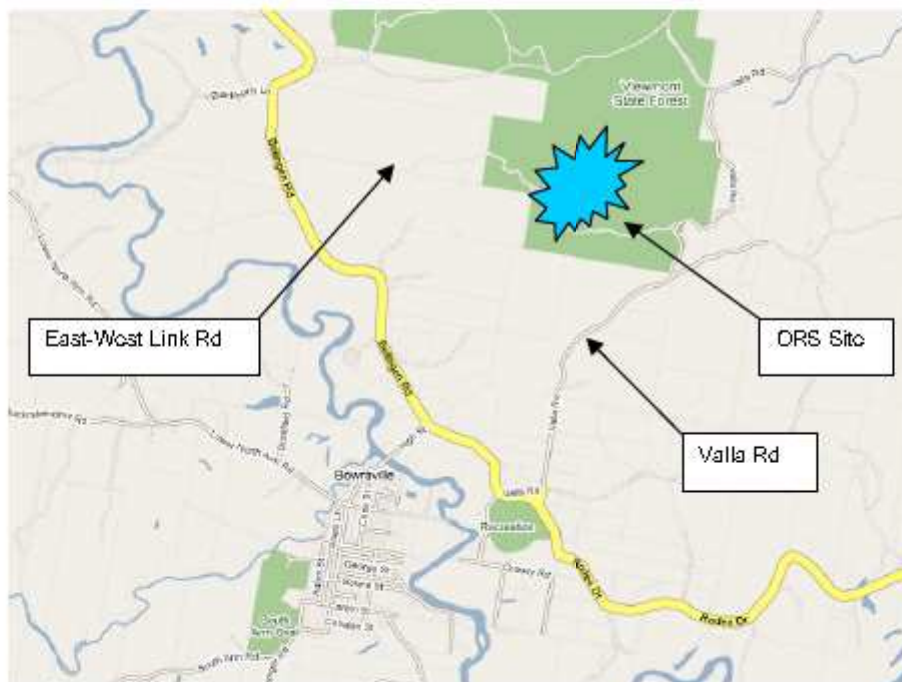


Figure 3 Local Access Roads

The available roads to provide access to the borefields and Off River Storage site comprise:

- ▶ Pacific Highway, linking to major centres north and south along the eastern coastline;
- ▶ Wilson Road linking Macksville to Bowraville essentially along the southern side of Nambucca River;
- ▶ Rodeo Drive, providing access from the highway to the works area at Bowraville;
- ▶ Wirrimbi Road and Old Coast Road providing a link from Rodeo Drive to Nambucca Heads and Pacific Highway, and;
- ▶ Bellingin Road and Valla Road, providing alternative access routes to the storage site from Bowraville;

It is anticipated that all major plant and equipment deliveries to the borefield and storage will be brought to the site via the Pacific Highway to North Macksville, then along Rodeo Drive (MR 118) and either Bellingin Road or Valla Road to the storage site.

An alternative route exists between Macksville and Bowraville, being Wilson Road. It is not anticipated that Wilson Road would be used for access to the site, as traffic would need to pass through the commercial and residential centres of both Macksville and Bowraville.

The Pacific Highway is the major east coast link road providing access between coastal centres between Sydney and Brisbane. It carries a high proportion of heavy vehicles through the centre of Macksville and would be the route along which any heavy equipment for construction and operation of the water supply would be brought into the region. The highway is fully funded and maintained by the NSW State Government through the Roads and Traffic Authority.



3.2.1 Rodeo Drive (MR 118)

Rodeo Drive is a two-lane two-way rural road that connects Pacific Highway at Macksville with the Bowraville region. It is classified as a "Regional Road" over its full length.

The road has the following characteristics:

- ▶ A circuitous winding alignment for most of the length apart from sections adjacent to the river;
- ▶ Most curves not being signposted with advisory speed signs;
- ▶ Total length of approximately 12.4 km to Valla Road intersection;
- ▶ Two lane, two way sealed pavement with centreline marked full length;
- ▶ Approximately 80% of the length is marked with double barrier lines prohibiting overtaking;
- ▶ Most road shoulders and verges are thickly grassed which in combination with few guideposts provides poor delineation of the road side limits;
- ▶ The pavement is currently in fair to good condition visually with few major failures;
- ▶ The bulk of the length is marked with speed de-restriction signs, except for the urban areas at both ends and a section of 70 km/h each side of the Wirrimbi Road intersection. Consequently, the state default speed limit of 100 km/h is generally applicable to the road;
- ▶ No signposted load limit for any bridge or culvert;
- ▶ Railway overbridge and two underpasses at three locations;
- ▶ A number of "curve intersection" and "School Bus Stop Ahead" signs have been installed.

If it is assumed that all traffic passing the count station at Macksville continues to Bowraville then the 2009 AADT from Sec 2.4.3. of 2,100 translates to 210 vph (vehicles per hour) as the peak hourly count.



Figure 4 View of typical signage along Rodeo Dr.

Rodeo Drive is the major link road between Macksville and Bowraville. It would be the route used to transport any heavy equipment to the dam site and the associated bore field and transfer facilities etc. It would also be the main route expected to be used by workmen and visitors travelling to and from the site from outside the local area.

The North Coast Railway line crosses Rodeo Drive at 3 locations.

- ▶ At 750m from Pacific Highway Rodeo Drive passes beneath a rail overbridge. On the river side there is virtually no road shoulder and there is a hole adjacent to the bridge pier. The narrowing road width is not warned to motorists with advance signs and a number of chevron type width marking signs have been lost. Signage should be rectified to comply with AS 1742. The vertical clearance is 4.6m.
- ▶ At 2.85 km a timber overbridge carries Rodeo Drive over the railway. The small radius bends on both sides of the bridge result in long loads crossing the road centreline. There is no signposted load limit, though some non standard advisory signs indicate that caution should be exercised in regard to long loads and that a 10 km/h speed limit should be adhered to.
- ▶ At 3.85 km the road descends into a cutting and turns 90° under the second rail underpass. The bridge piers are behind the road shoulders. The general arrangement appears to be satisfactory. The vertical clearance to the road is not signposted as the height appears to be above the highest level requiring signage.



Figure 5 First rail underpass with deficient signage.



Figure 6 2nd rail crossing - long load using full road width.



Figure 7 Non standard signage at second rail crossing.



Figure 8 Third rail crossing on Rodeo Drive with high clearance.

3.2.2 Wilson Road

An alternative route from Macksville to Bowraville is Wilson Road. This route generally follows the southern side of Nambucca River initially through the commercial centre and residential area of Macksville directly to the residential area of Bowraville. Due to the connectivity of the residential areas, it may have a higher traffic count than Rodeo Drive, even though it has a lower road classification status.

From Macksville the route would be via the traffic signal controlled intersection into Wallace St, along the main shopping centre, turn right into Princess St, then left into McKay St, cross the railway level crossing before the bridge over Tilly Willy Creek, then along Joffre St, and over the high level bridge over Taylors Arm to the start of Wilson Road.

Crossing of the railway level crossing may prove to be problematic for wide and heavy low loaders with large construction plant. The use of this route should be discouraged for such traffic.

Between Macksville and Bowraville, Wilson Road is constructed as an interurban connector route with a sealed surface, linemarking and some advisory speed signs and curve warning signs for lower than average curve radii. Curves were noted being marked with 45 and 55 km/h advisory signs. The sealed road width was noted as being 6.4m.

The distance to the intersection of Rodeo Dr and High St at Bowraville from Macksville is almost identical to the distance via Rodeo Drive at approximately 13.5km. However, the use of Wilson Road is not favoured due to the need to pass through the commercial centres of Macksville and Bowraville as well as the surrounding residential areas. There were no load limits noted on any of the bridges on this route.

To the start of Valla Road, the Wilson Road route would be about 1.2km longer than the Rodeo Drive route.



Figure 9 Railway Level Crossing at Macksville on the Wilson Road route.



Figure 10 Typical alignment and standard of Wilson Road.

3.2.3 Wirrimbi Road

Wirrimbi Road joins to Old Coast Road and provides a link from Rodeo Drive to Nambucca Heads. It is constructed to a similar standard and alignment as Wilson Road and Rodeo Drive. It would be suitable as an access route to the dam site in conjunction with Old Coast Road to Nambucca Heads. Refer to section 2.5.2 for further details in regard to travel distances and road route conditions.

3.2.4 Bellingen Road

Bellingen Road is a bitumen sealed two-lane two-way road connecting the towns of Bellingen with Bowraville and surrounding areas. It is also classified as a "Regional Road" over its full length.

Bellingen Road intersects with Rodeo Drive to the south of the site and passes to the west of the dam site. The use of Bellingen Road for access to the dam site is an option that is considered by this assessment. In addition Bellingen Road would be used for access to the Headworks, treatment plant, bore field and pipelines that will provide interconnection between the riverside facilities and the Off River Storage dam.

Traffic count data received from NSC indicates that the road has an AADT of 779 in September 2005 at the southern end near Bowraville. Assuming a conservative growth rate of 3% the 2009 AADT would be 878. The count information indicates a considerable reduction in traffic density with increasing distance from Bowraville. At 4.65 km from Bowraville the extrapolated 2009 AADT would be 439. Assuming a linear reduction in traffic with distance from Bowraville would be conservative as there is a concentration of population in the first kilometre however, on this basis the approximate AADT at 2.5 km would be 640.

Comparison of the NSC traffic count data with the historic RTA data does not indicate any obvious inconsistencies.

At a distance of 2.5 km from the commencement of Bellingen Road at High St Bowraville, a road reserve intersects on the eastern side just past the end of the school zone for Tallowood

School. The angle of the intersection is approximately 70 degrees. At present the road formation is un-named and un-made apart from two concrete wheel tracks running down to and up out of the first gully. The road is currently used by one property resident to access a house about 500m from Bellingin Road.

The road reserve continues in an east, south easterly direction toward the State Forest and is contiguous with the second dam site access option, being from Valla Road. In this report the road is referred to as the "East – West Link Road".

The intersection of the East – West Link Road with Bellingin Road has been assessed in respect of engineering characteristics as noted in the Austroads publication, "Guide to Traffic Engineering Practice – Part 5: Intersections at Grade"(GTIAG). Sight distances have been measured in accordance with Figure 6.2 with 5m offset and 1.05m eye height. Intersection sight distances referenced to particular design speeds have been taken from Tables 6.3 and 6.4.

Characteristics of the intersection are as follows:

- ▶ Angle of intersection approximately 70°;
- ▶ Bellingin Road grade approximately 5% rising to the north;
- ▶ Bellingin Road seal width 6.5m with 1.2m to 1.5m shoulder width and centreline painted linemarking;
- ▶ Available sight distance approximately 270m south;
- ▶ Available sight distance approximately 108m north before being limited by a curve and cutting. With clearing of roadside vegetation and some earthworks the sight distance may be improved by approximately 20m.

Turning movements into and out of the Link Road would be a right turn into the road from Bellingin Road a left turn out of the Link Road into Bellingin Road.

A potential conflict arising from vehicles turning right into the Link Road across the path of southbound vehicles should be considered. The available sight distance is 108m. Due to the immediately adjacent curve it is considered that the approach speed would not exceed 70 km/h. For 70 km/h the minimum Approach Sight Distance (ASD) is 82m plus say 6m extra for grade correction, totals 88m. For 80 km/h the minimum ASD is 103m plus say 8m extra for grade correction, totals 111m.

For the left turn exit the risk is from an exiting vehicle entering the traffic stream to proceed south, stalling before accelerating away, being an obstruction to a following vehicle not being able to stop. The potential for this type of accident has a much lower probability than the first case above.

Therefore, it is considered that if the intersection was properly constructed with a sealed pavement and adequate turning radii etc that satisfactory access could be provided to the dam site via this route for light vehicles during the construction phase. The increased usage of the intersection would warrant the installation of intersection warning signs on both approaches in Bellingin Road. A speed survey on the northern approach may be warranted to confirm the design approach speed.

If the northern approach design speed exceeds 60 km/h (SISD 113m minimum) then the long term use of the intersection for access following construction could not be recommended without improvement of the sight distance available.

The use of the Link Road to enable heavy vehicles and long loads to access the dam site would require the implementation of traffic control measures during the work period to ensure that conflicts do not arise when the intersection is obstructed by large turning vehicles. It would be expected that the implementation of traffic controls would be an integral part of the worksite Traffic Management Plan for the project.



Figure 11 Intersection sight line northward along Bellingin Road.



Figure 12 Intersection sight line southward along Bellingin Road.



Figure 13 Current condition of Link Road intersection with Bellingin Road.

Access to Headworks from Bellingin Road

Access to the existing Headworks is from the western side of Bellingin approximately 750m north of High St. The entry is via a sealed one way lane adjacent to the western side of No 75 Bellingin Road. The access is just beyond a right hand curve travelling north and is approximately 20m inside the end of the 60 km/h speed zone leaving Bowraville.

It is apparent that a busy dairy business operates approximately 250m further north along Bellingin Road. Flashing lights and additional signage have been installed at the dairy location to assist with traffic management. There is also a "60 km/h AHEAD" warning sign installed approximately 300m west of the speed zone to assist with reducing the speed of approaching traffic. The sign would assist with reducing the approach speed at the Headworks entrance.

Advice from NSC is that the access is part ROC and part public lane. The number of vehicles accessing the Headworks site on a daily basis would generally be limited to one or two vehicles. Consumable materials are usually delivered on a monthly basis, which would increase the daily movements on those days. On occasions when significant maintenance works are being carried out, the daily movements would increase over the period of works accordingly.

As the access has limited width and appears to provide access to the Headworks only it may be reasonable to assess the available sight distance in accordance with AS 2890.1 –2004 Parking Facilities – Off Street Car Parking. For 60 km/h design speed and a domestic driveway the minimum sight distance is 55m. For other access driveways the desirable and minimum sight distances are 83m and 65m respectively. If it is assumed that the approach speed from the west past the dairy is 80 km/h then the desirable Stopping Sight Distance is 111m.

Available sight distances were measured on site. The actual sight distances compared with relevant criteria are summarised in the table below.

Table 6 Sight Distances at Headworks Access

Design Speed	Available Sight Distance (m)	Sight Distance for Domestic property (m)	Sight Distance for Other than Domestic Driveways (m)	
	Available	Desirable	Desirable 5s gap	Minimum SSD
60 km/h	190m North SISD 181m North ASD 114m South	55m	83m	65m
80 kmh	190m North SISD 181m North ASD 114m South	95m	111m	105m

Generally the available sight distance to the north considerably exceeds the sight distance requirements for an approach speed of 80 km/h. To the south, where vehicle speeds should not be greater than 60 km/h the sight distance also meets the 80 km/h requirement even though the sight line is restricted by vegetation on the inside of a curve. With minor clearing an extra 30m of sight distance should be attainable.

If any upgrading works are proposed at the Headworks the design of the connection to Bellingin Road should be assessed in detail against current standards.

Figure 14 Western approach to Headworks access.



Figure 15 Sightline to north of Headworks access.



Figure 16 Access lane to Headworks



Figure 17 Headworks access sight line toward Bowraville.

3.2.5 Intersection of Valla Road with Rodeo Drive

Valla Road is a secondary rural road used for property access and to access forestry areas. It connects to the Valla district north of Nambucca Heads. Valla Road intersects with Rodeo Drive 12.4 km from Macksville and 1.1 km before the High St intersection at Bowraville.

Valla Road currently provides the most readily accessible route to the dam site. It forms a T junction with Rodeo Drive opposite the Bowraville Showground. A photo of the intersection is shown below. The sealed pavement ends just beyond the crest shown in the photo below, 70m from Rodeo Drive. "Turning Trucks" and a "Gravel Road with Loose Surface" signage indicates the conditions that may be encountered further along Valla Road.



Figure 18 Current condition of the intersection of Valla Road with Rodeo Drive.

The Valla Road intersection is located on a sweeping curve in Rodeo Drive. Characteristics of the intersection are as noted below:

- ▶ Angle of intersection of roads approximately 90° with the inclusion of a 25m long approach horizontal curve in Valla Road;
- ▶ Rodeo Dr grade approximately level;
- ▶ Valla Road grade approximately 6% falling to the intersection;
- ▶ Rodeo Dr seal width 6.5m with 1.2m to 1.5m shoulder width and centreline painted linemarking;
- ▶ Valla Road has no Give Way signage or centreline marking approaching the intersection;
- ▶ Valla Road seal width 7.8m with minimal shoulders approximately 25m from the intersection;
- ▶ A large sawmill operates from land on the eastern side of Valla Road at the intersection. Primary access appears to be from Balance Tank Road just beyond the crest in Fig 12 above. The gravel access track on the eastern (right) side of Valla Road in Fig 12 above appears to be an occasional exit path. Given the low traffic volume in the area there would seem to be a low probability of traffic interaction by use of the exit.
- ▶ Intersection sight board located opposite the Valla Road approach to the intersection;
- ▶ The default speed limit of 100 km/h applies to the area of the intersection;
- ▶ The Bowraville 60 km/h speed zone commences 220m north west of the intersection along Rodeo Dr;
- ▶ There is no intersection lighting provided;
- ▶ A 40m long left turn deceleration and turning lane is located in Rodeo Drive on the Bowraville side of the intersection.
- ▶ Available sight distance approximately 340m southeast toward Macksville;
- ▶ Available sight distance 160m northwest toward Bowraville before being limited by a crest.

The available sight distance of 340m toward Macksville is considerably in excess of the desirable Safe Intersection Sight Distance (SISD) of 253m for a design speed of 100 km/h.

Given that vehicles approaching from Bowraville enter the available sight distance 60m after exiting the 60 km/h urban speed zone, the design approach speed could be considered to be say 80 km/h. For 80 km/h the minimum SISD is 170m and the desirable ASD is 114m.

Therefore, it is considered that the intersection will provide satisfactory access to the dam site via this route for light vehicles. The increased usage of the intersection would warrant the installation of intersection warning signs on both approaches in Rodeo Dr.



Figure 19 Valla Road approach to Rodeo Dr.



Figure 20 Valla Road intersection sight line toward Macksville.



Figure 21 Valla Road Intersection sight line toward Bowraville.

3.2.6 Valla Road

Valla Road is a narrow two way gravel road. The pavement is unsealed and has a loose gravel surface and is corrugated in sections. The roadway is not delineated with guide posts and has numerous close trees which would be hazardous to errant vehicles. There are no curve warning or advisory speed signs in the length from Rodeo Drive to the intersection with the eastern end of the East – West Link Road noted in 3.2.4 above, which is 2.5 km from Rodeo Drive.

Standard advisory signage located near Rodeo Drive warns drivers of turning trucks and the gravel road with loose surface. Other signage advises caution due to log trucks using the road.

NSC did not have any traffic count data available for Valla Road however, there are very few houses in the few kilometres at the southern end of Valla Road and it appears that most traffic from the rural enterprises surrounding the northern half of the road would travel via the connection to Pacific Highway which is sealed for approximately 8.2 km. The southern end of Valla Road may have an AADT considerably lower than 200. The peak hourly volume for an AADT of 200 would be 20 vph.



Figure 22 Valla Road - typical view of pavement and roadside conditions.

The intersection of the East – West Link Road with Valla Road has been assessed in the same manner as for Bellingin Road. Characteristics of the intersection are as follows:

- ▶ Angle of intersection approximately 90° located on the outside of a sweeping bend;
- ▶ Valla Road grade approximately 3% rising from the south to the intersection, then level to the north;
- ▶ Valla Road gravel pavement width approximately 4.5m with 1.2m to 1.5m shoulder width;
- ▶ Available sight distance approximately 55m south limited by the road curvature and a high cutting;
- ▶ Available sight distance approximately 85m north before being limited by a curve and cutting.

Turning movements into and out of the Link Road would be a left turn into the road from Valla Road and a right turn out of the Link Road into Valla Road.

A potential conflict arising from vehicles turning right out of the Link Road across the path of vehicles approaching from both directions should be considered. The available sight distance is 55m and 85m. Due to the immediately adjacent curves, the generally winding alignment and the rising southern approach it is considered that the approach speed would not exceed 40 km/h. For 50 km/h the minimum Approach sight distance (ASD) is 47m and the desirable ASD is 54m. A safety margin can then be assumed to be available to apply against the longer braking distance applicable for the gravel pavement.

Therefore, it is considered that the intersection would provide satisfactory access to the dam site via this route for light vehicles. The increased usage of the intersection would warrant the installation of intersection warning signs on both approaches in Valla Road.

The use of the Link Road to enable heavy vehicles and long loads to access the dam site would require the implementation of traffic control measures during the work period to ensure that conflicts do not arise when the intersection is obstructed by large turning vehicles. It would be

expected that the implementation of traffic controls would be an integral part of the worksite Traffic Management Plan for the project.



Figure 23 Sight line north along Valla Road.



Figure 24 Sight line south along Valla Road.

3.2.7 East - West Link Road

Mapping of the area indicates that a road reserve is aligned approximately east to west and runs between Valla Road and Bellinghen Road. It runs approximately through the centre of the dam water storage area, near the dam wall, and has the potential to be used to access the dam construction area from both the east and west sides. The road is currently used to access adjoining private properties and forestry operations in the Viewmont State Forest. The dam storage area will be located within the current state forest in an area being purchased by NSC.

The eastern leg of the road, which connects to Valla Road is currently being used to access the dam site for geological and environmental studies of the area. Only the section near Valla Road is currently formed and gravelled for vehicular traffic. A short distance from Valla Rd the road condition reverts to an earth track. Inspection of the road indicates that access to a private property is regularly travelled 1.0 km from Valla Road. The track is typically not less than 3.5m wide, not graded and with no provision for drainage. There are five (5) sharp crests which limit sight distance.

In its current form the track would not be suitable for site access for either workmen or for deliveries of plant and materials.

It is anticipated the preferred site access will be via this link road from Valla Road. To be suitable for access during construction the road would need to be upgraded to a standard similar to the opening of a new rural road. NSC's current standards for such works are expected to be suitable for upgrading of the road to suit construction traffic and for the occasional post construction visitor to the dam site.



Figure 25 The start of the link road from Valla Road.

3.2.8 Intersection of Ferry St/Rodeo Dr with Pacific Highway

Rodeo Drive intersects with Pacific Highway at a T junction immediately adjacent to the steel truss bridge over Bellinger River. The speed zoning for both roads in the locality is 50 km/h. Immediately north of the intersection the highway curves through 90° to align with the river. The curve has a crash barrier on the outside together with numerous fluorescent CAM's and combination oversize truck tilting and curve advisory speed signs.

The SISD at the intersection was assessed for a vehicle turning left and right from Rodeo Drive. The available sight distance north was 115m across the chord of the curve and a "filtered" sight distance of 120m was available onto the bridge superstructure to vehicles approaching from Macksville. Some obstruction to the line of sight was presented by bridge railings and guardfencing. For a design speed of 50 km/h the minimum and desirable SISD is 89m and 96m respectively on level approaches. Therefore, the intersection is expected to work satisfactorily

from a safety perspective under most traffic conditions. Due to the high traffic volumes encountered on Pacific Highway, especially during holiday periods it is likely that the limited entering opportunity may result in drivers attempting to enter the highway traffic stream when presented with less than recommended gap times.



Figure 26 Intersection of Rodeo Dr with Pacific Highway.



Figure 27 Rodeo Dr approach to Pacific Highway.



Figure 28 Driver's sight line north of Rodeo Dr.



Figure 29 Driver's sight line south of Rodeo Dr.

3.2.9 River and Creek Crossings

There does not appear to be any restriction to access to the storage site, the Headworks or any of the existing or proposed borefield areas due to narrow width of bridges or reduced load capacity. The following bridges have been reviewed as part of this assessment:

- ▶ Bridge over Nambucca River at Bowraville on High St. A 2 lane timber bridge with wide pedestrian path on the upstream side and timber hand rail on the downstream side.
- ▶ Mottleys Bridge over Bowra Creek on Rodeo Drive. A 2 lane concrete decked bridge with W beam guardfence both sides and pedestrian footpath on the upstream side.
- ▶ Brouggys Bridge over South Creek on North Arm Road. A low level 2 lane plus pedestrian path bridge with W beam guardfence both sides.



- ▶ Unnamed timber bridge over minor creek on North Arm Road approximately 250m west of Bruggys Bridge between South Creek and Borefield Road. Low level timber railing both sides with no pedestrian pathway.

None of the bridges noted above has signposting for narrow width or load limit restrictions.

3.2.10 Signs and Delineation

Previous sections have identified particular deficiencies in signage at certain locations. It was generally found that the standard of signage is consistent with other similar local government areas.

The provision of roadside delineation is also quite varied. More significant roads such as Rodeo Drive, Wilson Rd and Bellingen Rd have intermittent guideposting, whereas, Valla Rd has virtually no guideposting. Again, the situation is probably consistent with other authorities.

There were no locations identified where the linemarking of road centrelines was considered to be incorrect however, a comprehensive audit of linemarking would normally be required to identify such requirements. Generally, sealed roads were linemarked with a centreline in fair condition.

3.3 Network Performance

Traffic volume count data is available from the RTA for sites on Pacific Highway at Macksville and also on MR 118, Rodeo Drive at Macksville and at Bowraville. The information is freely available to the public via the internet at www.rta.nsw.gov.au. The latest count year is 2004. The count data has been extended to 2009 as the base year assuming a compound annual rate of growth determined from analysis of the historic data.

The site descriptions are as follows:

09.244 – SH10 Pacific Highway - Macksville at Nambucca River Bridge, 512.6 km (southern side of river).

09.231 – SH10 Pacific Highway - Macksville – N of MR 118 Ferry St, 512.9 km

09.347 - MR No 118 Macksville – Bellingen, Macksville – W of SH10, Pacific Highway, 0.1 km

09.349 – MR No 118 Macksville – Bellingen, Bowraville – S of MR118 (Branch), 13.0 km

09.350 – MR No 118 Macksville – Bellingen, Bowraville – N of MR118, Macksville Road, 13.4 km

Appendix B contains the traffic count data obtained from the RTA information together with the extrapolated traffic data up to year 2009.

The two sites on Pacific Highway indicate an average growth rate of 3.2% which results in an extrapolated 2009 AADT of 19,950. The count sites on MR 118 at Bowraville exhibit growth rates of 2.5% and 2.7% and a declining rate of nearly 2% for the site north of High St (Station 09.350) based upon counts in 1982 and 1986. It is unlikely that the old counts are representative of actual current traffic conditions. Therefore, it has been assumed that all sites near Bowraville have a growth rate of 3% and that the site north of High St is 67% of the count

south of High St. This action will result in a conservative assessment being made. A summary of the extrapolated 2004 and 2009 base year count AADTs is contained in the table below.

Table 7 Traffic Count Stations and Volumes up to 2009

Station	Location	AADT 2004	AADT 2009
09.244 and 09.213	Pacific Highway Macksville	17,140	19,950
09.347	Rodeo Dr Macksville	1,800	2,100
09.349	Bellingin Road south of High St	1,400	1,650
09.350	Bellingin Road north of High St	950	1,100

The existing road network performance has been assessed based on known and assumed traffic data at the three (3) key intersections within the study area as listed below:

- ▶ Intersection of Rodeo Drive and Valla Road;
- ▶ Intersection of Valla Road and Road A; and
- ▶ Intersection of Bellingin Road and Road B.

The performance of the intersection of Rodeo Dr (MR118) with Pacific Highway will not be considered further as the traffic contribution to the overall operation of the intersection is considered to be negligible both for the construction and operation phases of the project when considered in relation to the projected volumes on Pacific Highway. Any requirement for upgrading of the intersection is expected to result from natural growth in the region, and would be expected to be fully funded by the RTA. The construction of a bypass of Macksville by the highway may well occur before further highway intersection upgrading occurs.

3.3.1 Road Network

The performance of the existing road network surrounding the development site has been assessed in terms of Level of Service (LOS). The LOS criteria has been based on peak hour flows per direction for urban roads and peak hour flows on two (2) lane two way roads (with design speed of 100 km/h) for rural roads as defined in RTA's Guide to Traffic Generating Developments and detailed in Table 8 and Table 9 respectively.

Table 8 Urban road peak hour flows per direction

Level of Service	One Lane (veh/hr)
A	200
B	380
C	600
D	900
E	1400

Source: RTA Guide to Traffic Generating Developments, October 2002, Version 2.2

Table 9 Peak hour flow on two (2) lane rural road (veh/hr)

Level of Service	Veh/hr
B	530
C	870
D	1410
E	2290

Source: RTA Guide to Traffic Generating Developments, October 2002, Version 2.2 Table 4.5

The LOS criteria in Table 9 is based on the following assumptions:

- ▶ Design speed of 100 kph;
- ▶ Terrain level with 20% no overtaking;
- ▶ An average of 15% heavy vehicles;
- ▶ 3.7 metre traffic lane widths; and
- ▶ 60/40 directional split of traffic.

Assuming that the peak hourly two way flow is 10% of the AADT then it is clear that current traffic density is well short of the hourly counts in the two tables above.

On Rodeo Dr at Valla Road the sum of local traffic plus peak construction traffic is $165 + 130 = 295$ vph. On Bellingen Road the sum of local traffic plus peak construction traffic is $110 + 130 = 240$ vph at Bowraville. Both peak volumes are 45% to 55% of the limiting volume for LOS B for a 2 lane rural road.

The number of vehicles expected to access the site during the construction phase will increase significantly at times when materials are being imported to site. Such co-incidence of operations is expected to occur for less than perhaps 50% of the construction period. At these times heavy vehicles may account for up to 25% of the peak traffic volume.

The resulting LOS when applied against the same data as contained in the table referenced above indicates that the LOS may drop in the range of B to C. This is still a good outcome and it is over a relatively short time period.

The current level of service for the key roads surrounding the site, being Rodeo Drive, Bellingin Road and Valla Road are expected to remain at LOS A to B for the foreseeable future.

3.3.2 Intersection Performance

The three (3) key intersections surrounding the site were investigated, based on the anticipated volumes in year in 2009 and 2019.

The expected traffic volumes on local roads during years 2009 and 2019 resulting from current activities in the are and anticipated natural growth are given in the table below;

Table 10 Traffic Flows

	Estimated Traffic 2009 (vph)	Estimated Traffic 2019 (vph)
Rodeo Dr at Valla Road	165	220
Valla Road at the Link Road	< 20	< 27
Bellingin Road at the Link Road	110	150

The traffic loading on the intersections with construction traffic is expected to be in accordance with the flows indicated below.

Table 11 Intersection Traffic Flows

	Estimated Traffic 2009 (vph)	Estimated Traffic 2009 (vph) plus Construction	Estimated Traffic 2019 (vph)
Rodeo Drive	165	295	220
Valla Road	20	150	27
Valla Road	20	150	27
Link Road	0	130	5#
Bellingin Road	64	194	86
Link Road	0	130	5#

Nominal Allowance for maintenance and tourism.

Comparison of Table 11 with Table 12 below confirms that a detailed analysis of each of the intersections is unnecessary due to the low flow volumes expected even with construction traffic included.

3.3.3 Intersection Capacity

The intersecting traffic volumes at Rodeo Drive and Valla Road and Bellinghen Road and the Link Road at full development are estimated to be about 2200 vpd and 640 vpd respectively. This corresponds to a two-way peak flow of about 220 veh/hr and 64 veh/hr.

Similarly, the intersecting traffic volume at Valla Road at the Link Road into the site is estimated to be considerably less.

For these low combinations of flows, the busier streets can comfortably absorb the minor road traffic at a good level of service. These combinations of flows are below the threshold values where intersection capacity analysis is normally required as shown below.

Table 12 Intersection Volumes below which Capacity Analysis is Unnecessary

Type of Road	Light Cross & Turning Volumes Maximum Design Hour Volumes vehicles per hour (twoway)		
Two lane major road	400	500	650
Cross road	250	200	100
Four lane major road	1,000	1,500	2,000
Cross road	100	50	25

Source: Austroads Part 2, Table 8.1 Roadway Capacity

3.4 Existing Crash History

The RTA has provided crash history for the period beginning July 2003 to June 2008 for the following roads;

- ▶ Pacific Highway within the Nambucca Shire;
- ▶ MR 118 Macksville to Bellinghen which includes Ferry St, Rodeo Drive and Bellinghen Road and;
- ▶ Full length of Valla Road.

A plan of recorded crashes is provided in Appendix C for each of the road sections noted above. The five-year crash history provided by the RTA has been reviewed to identify any features which may be relevant to this study. The review has been performed for:

- ▶ Intersection of Rodeo Dr/Ferry St and Pacific Highway;
- ▶ The length of Rodeo Drive from Pacific Highway to Valla Road;
- ▶ Intersection of Rodeo Dr and Valla Road;

A general review of the available crash data indicated no obvious anomalies which would warrant further investigation of the crash data that may point to particular road characteristics that would warrant further attention or corrective actions.

The Crash data is provided in Appendix C, and is summarised in Table 13.

Table 13 Crash Analysis Summary

Location	No. of injury crashes	No. of non injury crashes	Total number of crashes	Total number of injuries	Majority of crashes
Intersection of Pac Highway & Rodeo Dr	5	2	7	6	Includes all crashes in the vicinity of the intersection, both in lane and turning types.
Rodeo Dr from Pac Highway to High St B'ville	15	12	27	17	60% of all crashes were associated with off road on curve types.
Intersection of Valla Road & Rodeo Dr	0	0	0	0	No crashes recorded in the database.
Bellingin Road from High St to Blackberry Lane	1	1	2	1	The injury crash was an off-road on-curve in close proximity to the Link Road intersection.
Valla Road full length	2	3	5	3	60% single vehicle off-road types, 40% 2 vehicle head-on type.

The key points relating to each of the above locations are:

- ▶ The high proportion of single vehicle off road on curve type crashes is indicative of the winding hilly terrain and the general lack of adequate delineation of the road alignment;
- ▶ No crashes were recorded at the intersection of Rodeo Dr and Valla Road;
- ▶ The crashes recorded in the vicinity of Rodeo Dr and Pacific Highway are not unexpected given the high traffic density at particular times. It does not indicate a particular problem in this area when considered in relation to the highway nearby;
- ▶ The map of crashes on MR118 indicates a number of groups of crash sites predominating. This appears to indicate that site specific local factors may be influencing the crash data;
- ▶ None of the key intersections investigated in this report figured in the crash statistics apart from Rodeo Dr and Pacific Highway;
- ▶ There were no recorded crashes involving pedal cyclists with Pacific Highway excluded.

3.5 Public Transport

Public bus services in the area are provided by Busways North Coast Pty Ltd. Busways operates from a depot at Macksville.

The Busways timetable indicates that 2 morning and 2 evening buses follow a loop route utilising both Wilson Drive and Rodeo Drive between Macksville and Bowraville on weekdays. They then continue on to Nambucca Heads and Coffs Harbour. A service also operates along Bellingin Road as far as Tallowood School 2.2 km from High St.



3.5.1 School Bus Services

Schools in the Bowraville area are:

- ▶ Bowraville Central School – 19 High St Bowraville;
- ▶ Gumbangiri Preschool – Bowraville;
- ▶ John Paul College – 2 Carbin St Bowraville, and
- ▶ Tallowood School – 220 Bellingen Road, Bowraville.

Bowraville Central School also operates a school farm off the end of Borefield Road.

School bus services use Rodeo Drive and Bellingen Road in order to access pick up and drop off locations at strategic intervals. There is no school bus traffic along Valla Road. Parents drive their children along Valla Road to a pick up point on Rodeo Dr.

Services are provided by Baldwins Bus Service from their premises at 53 Borefield Road and Chezmar Bus Services.

The project is not expected to have any significant impact on public transport services in the area.

3.6 Pedestrians and Cyclists

All of the roads surrounding the storage site and associated with the bore field are outside the urban area of Bowraville. Consequently, they do not provide footpaths for pedestrians.

None of the roads provide either on road or off road cycleways. Both pedestrians and cyclists must share the road pavement or verge with motor vehicles and other road users.

It is considered that the absence of specific facilities is appropriate given the expected low demand for services and the limited ability of NSC to provide such facilities.

3.7 Parking

There is a potential for parked workers' vehicles to create an access nuisance to local residents and motorists if there is not adequate provision for parking within each works site area. NSC can require all construction workers and operational vehicles to be accommodated within the works site by the inclusion of an appropriate condition in the Development Approval.

Preliminary design details have been prepared for an on site parking and turning area as part of public facilities which may be constructed. The indicative area is approximately 100m x 25m and is expected to be more than sufficient for expected demand on completion of construction.

4. Traffic Impact of the Proposed Development

4.1 Construction Impacts

A Traffic Impact Assessment for a development proposal normally is focussed on the ongoing impact of the additional traffic generation due to the development in concert with the natural growth of traffic in the locality after 10 years of operation. In this case it is difficult to quantify the long term impacts as they are expected to be extremely low in comparison with the current background traffic and the natural growth of local traffic indicated to occur in the next 10 years. Therefore, this report has emphasised the possible construction impacts in order to fully appreciate the potential short term impacts.

It is clear that large construction equipment may be used on site. Any oversize loads will require travel permits and escorts in accordance with the current permit system. Such transport movements are expected to work quite satisfactorily outside of the development approval system applying to the construction of the storage and the borefield enhancement etc.

Most materials to be delivered to the storage site and for construction of pipelines and the borefields are expected to be delivered in a range of trucks up to semi-trailer size or truck and dog combinations. Such vehicles can be adequately catered for by the existing road network.

If all construction access is to be via Bellingin Road then the current AADT at the Link Road intersection would increase from 640 to 770. An increase of 20% for the short term. By comparison, if the natural traffic growth in the area is 2.5% to 3% then natural growth will produce a similar increase without the construction traffic in 6 to 7 years.

If all construction access is to be via Valla Road then the estimated current AADT at the Link Road intersection may increase from say 200 to 330. Whilst this is a relatively significant impact over the current base, as the base traffic is extremely low the potential adverse impact on other motorists or surrounding properties is also quite small.

In regard to the potential impact upon Rodeo Drive, assuming that all traffic travels east of Valla Road then the AADT may increase from 1,650 to 1,780. This is an increase of 8%. By comparison, if the natural traffic growth in the area is 3% then natural growth will produce a similar increase without the construction traffic in 3 years.

It is clear then that the construction period impacts are relatively low in comparison with existing traffic levels and equate to relatively short periods of natural traffic growth.

A large proportion of the overall works will take place in areas away from public roads. Activities which may impinge on the availability of public roads for use by other motorists would include:

- ▶ Possible construction of the dual use connecting pipeline from the Headworks to the storage site along a length of Bellingin Road, and;
- ▶ Crossing of Bellingin Road by the pipeline.

Both of these activities would require the implementation of approved Traffic Management Plans for the safe working of the construction activities whilst under traffic. As mentioned previously, the movement of oversize construction plant on public roads will also require the implementation of traffic management procedures which will impinge on the availability of the public thoroughfare.



4.2 Operational Impacts

Activities that are anticipated once the scheme becomes operational could include the following:

- ▶ Maintenance of pumps and pumping facilities associated with each individual borefield pump station;
- ▶ Maintenance of the borefield Headworks facilities;
- ▶ Maintenance of the rising main and delivery main connecting the Headworks with the storage dam.
- ▶ Routine maintenance works associated with the storage and dam, and;
- ▶ Security inspections of the facilities.

It is expected that the water storage will not be available for recreational usage in order to protect water quality. A viewing area may be provided for public access, but visitor numbers would be expected to be very low as public amenities are not expected to be provided and the scenic value is not expected to be high.

In terms of daily traffic movements associated with the range of activities listed above, there may be none to a handful per day and the frequency of days may be irregular. Therefore, operational impacts are difficult to quantify and relatively insignificant.

5. Key Findings

The key findings in this traffic study are:

- ▶ Long term operational impacts of the development are expected to be insignificant when compared to the natural growth of traffic in the region;
- ▶ Short term construction impacts for cartage of materials to the storage site are significant due to the current relatively low traffic volumes on the roads in the study area;
- ▶ Short term construction impacts for associated with other construction activities are relatively insignificant due to the relatively low traffic volumes generated on the roads in the study area;
- ▶ Short term construction impacts are relatively insignificant in comparison with the indicated natural traffic growth;
- ▶ The existing roads available to provide access to the main construction site for the storage dam have sufficient capacity to absorb the increased traffic resulting from short term construction;
- ▶ Provision of access to the dam site via the western link road off Bellinghen Road does not appear to be feasible due to the very limited area available for turning at the entry in to the dam site;
- ▶ Provision of access into the dam site via the existing Crown Road off Valla Road appears to be necessary in order to maintain a connection to a ROC which serves an internal lot with apparently no other access;
- ▶ Temporary traffic control measures are expected to be required at the intersection of Bellinghen Road and the East-West Link Road if this route is to be used for access to the dam site;
- ▶ The long term use of the western access route to the storage via Bellinghen Road and the East-West Link Road is not recommended unless the sight distance north of the intersection can be improved to meet SISD requirements. There will also be a relatively higher cost for the construction of this route;
- ▶ To avoid traffic associated with the construction of the storage dam traversing through Bowraville, the use of MR 118, Rodeo Drive could be stipulated for construction traffic. This would prevent traffic using Wilson Road.
- ▶ The use of Valla Road as the key local access route to the storage dam site is the preferred option.
- ▶ The existing forestry access road, referred to as the East-West Link Road off Valla Road requires upgrading in terms of width, pavement, drainage and vertical alignment. NSC's construction standards should adequately cater for engineering requirements.
- ▶ The use of MR 118, Rodeo Drive from Macksville to Bowraville is a suitable link road from Pacific Highway to the works area. Upgrading of traffic management facilities associated with the railway crossings at 0.75 km and 2.85 km is recommended.



- ▶ The main route for construction access and the delivery of materials to the dam site is expected to be along Valla Rd from Rodeo Drive. Valla Rd will require regular maintenance during the construction period as part of an overall traffic management and maintenance plan.

6. Recommendations

This traffic study has not identified any matters which would prevent the proposed development from proceeding.

It is recommended that the following items be considered for inclusion as requirements of a development approval or be implemented by NSC.

- ▶ That a comprehensive traffic management plan be prepared and submitted to NSC for approval detailing construction period transport activities, site access, parking and stockpile areas for the duration of the works.
- ▶ That MR 118 Rodeo Drive from Macksville to Bowraville be the principal access route to the site from Pacific Highway and from areas to the south of Macksville.
- ▶ That the section of the East-West Link Road off Valla Road be used for access to the dam site, and be upgraded in accordance with NSC standards and requirements.
- ▶ That vehicular access to Lot 2 DP 1076377 be maintained as part of any changes to road status and access routes associated with the acquisition of the dam site area by NSC.
- ▶ That NSC undertake improvements to the delineation and signposting of the two railway crossings on MR 118 as noted previously.
- ▶ That if Wirimbi Road is used as a materials supply route, that the signposted load ratings be confirmed for the particular class of vehicle to be used.
- ▶ That the unsealed length of Valla Rd, if used for delivery of materials to the dam site be regularly maintained during the course of the works in accordance with a dust control, maintenance and intervention strategy approved by NSC.



7. References

- ▶ AUSTROADS (1988) Guide to Traffic Engineering Practice – Part 2: Roadway Capacity;
- ▶ AUSTROADS (2005) Guide to Traffic Engineering Practice – Part 5: Intersections at Grade;
- ▶ RTA (2002) Guide to Traffic Generating Developments;
- ▶ NSC DCP 1: Off Street Parking; and
- ▶ RTA (2004) Traffic Volume Data for Northern Region.

Appendix A

Development and Access Plans

Bowraville Off-River Storage Concept & Access

DP 1076377

DP 1092320

CA)

CA: _____

NEW EVENTS

1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 26

EPLAN 2012

MISSABOTT

—From the first and 2nd of November to—

Survey Central
 Generating Population

a marketer registered under the Copyright Act. The survey requested in this plan is necessary

This survey relates to: ROULETTE CARROUSEL

75 - NORTH AVENUE

DP 1076377
DP 819614
DP 819614

M. 1636-7714

associated public health, is critical public health research, assessment, interventions on the individual community.



Appendix B

Traffic Data

AADT: RTA Northern Region 2004

Road	Station	Location	Road Name	AAD T	AAD T	AAD T	AAD T	AAD T	AAD T	AAD T	AAD T	Avg Annual Growth rate (%)
SH 10 Pacific Highway	09.244	Macksville - At Nambucca River Bridge	Pacific Highway	1982	1986	1990	1992	1995	1998	2001	2004	3.10%
				8110	9197	7	5	1301	1488	1714	0	
								1	1	1	0	
Macksville - N of MR 118, Ferry St	09.213	Macksville - N of MR 118, Ferry St	Pacific Highway	7460	8511		1296	1381	4			3.30%
							1					
Macksville 0.1km W of SH 10	09.347	Macksville 0.1km W of SH 10	MR 118 Rodeo Dr	1030	1174	1257						2.50%
Bowraville S of MR 118 branch 13.0km to SH10	09.349	Bowraville S of MR 118 branch 13.0km to SH10	MR 118 Rodeo Dr	610	950	1133	1356	1263	1075	1323		2.70%
Bowraville N of MR 118 branch 13.4km to SH10	09.350	Bowraville N of MR 118 branch 13.4km to SH10	MR 118 Rodeo Dr	510	472							-1.90%

BELLINGEN RD TRAFFIC COUNT DATA RECEIVED FROM NAMBUCCA SHIRE COUNCIL WITH EXTENSIONS ADDED FOR 2009 AND 2019.

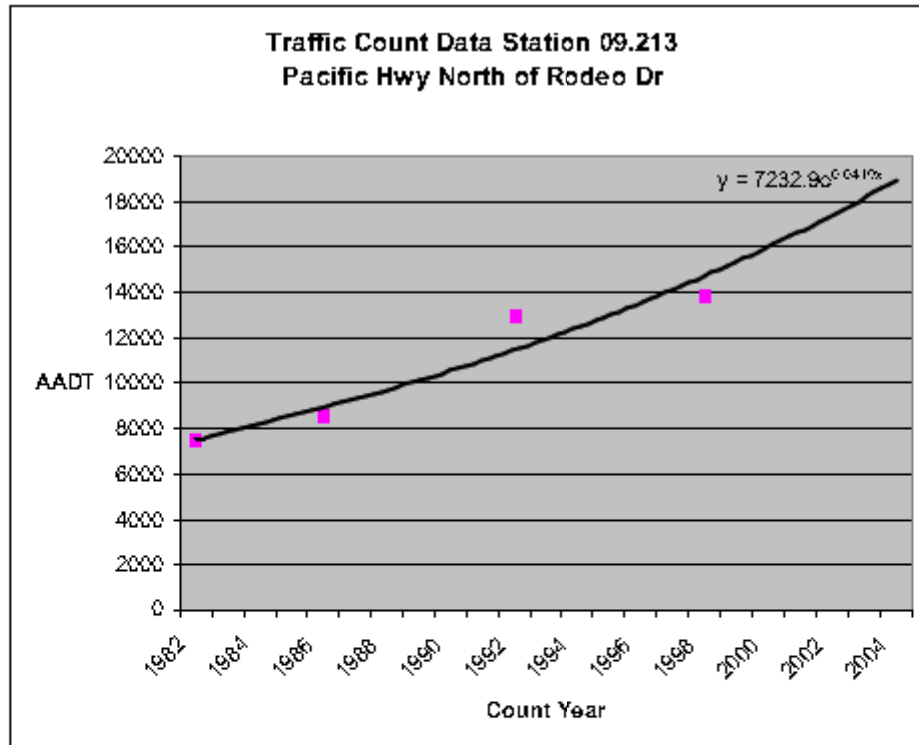
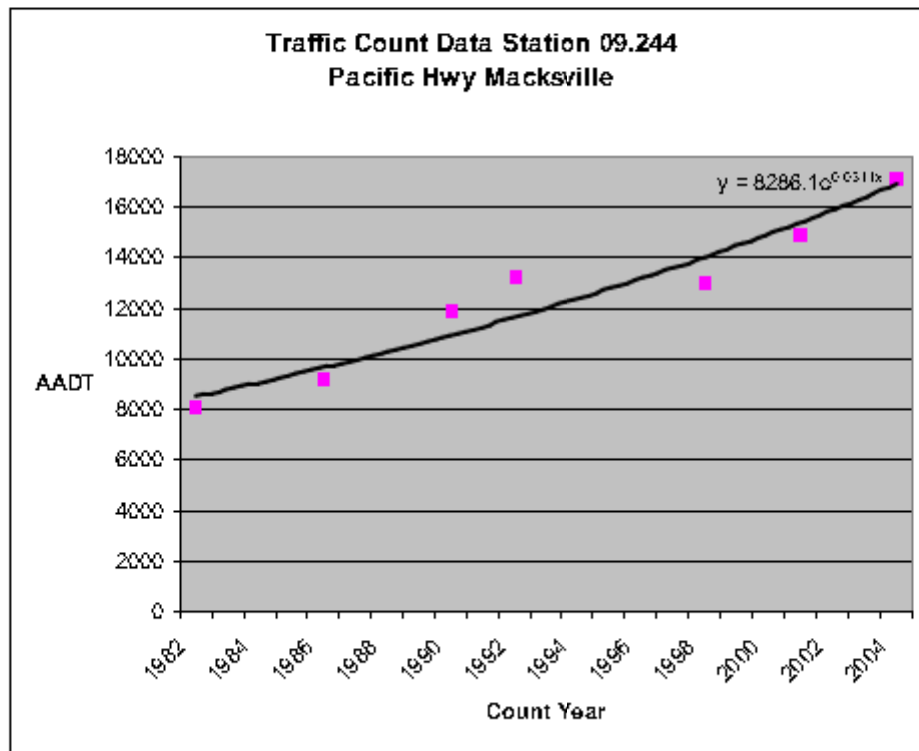
Road Name	CH Start	CH End	Length	Seal Width	Light	Heavy	% Heavy	Term	Total Count	ADT	AADT	Last Count	AADT 2009	AADT 2019
Bellingen Rd	0	0.53	0.53	6.5	4886	322	6.2%	7	5,208	744	779	1/09/2005	878	1,183
Bellingen Rd	4.652	5.676	1.024	6.5	2471	154	5.9%	7	2,625	375	392	1/09/2005	439	591
Bellingen Rd	5.696	6.194	0.498	4.0	756	42	5.3%	7	798	114	119	1/09/2005	130	180



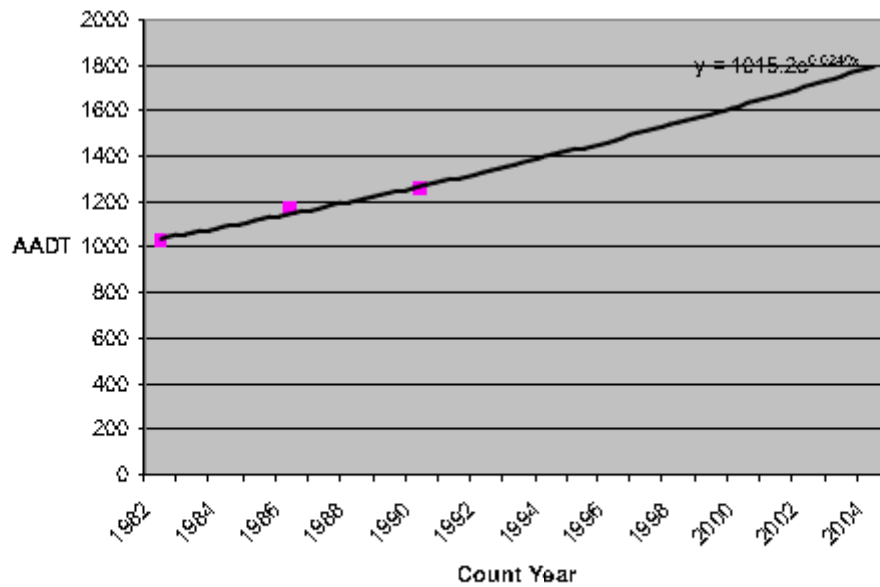
**AADT: RTA Northern Region 2004
With Extensions added for 2009 & 2019**

Road	Station	Location	Road Name	AADT 2004	AADT 2009	AADT 2019	Avg Annual Growth rate (%)
SH 10 Pacific Highway	09.244	Macksville - At Nambucca River Bridge	Pacific Highway	17,140	19,950	27,100	3.1%
	09.213	Macksville - N of MR 118, Ferry St	Pacific Highway	17,140	19,950	27,100	3.3%
MR118 Rodeo Drive	09.347	Macksville 0.1km W of SH 10	MR 118 Rodeo Dr	1,800	2,100	2,800	3.0%
	09.349	Bowraville S of MR118 branch 13.0km to SH10	MR 118 Rodeo Dr	1,400	1,650	2,200	3.0%
	09.350	Bowraville N of MR118 branch 13.4km to SH10	MR 118 Rodeo Dr	950	1,100	1,500	3.0% [*]

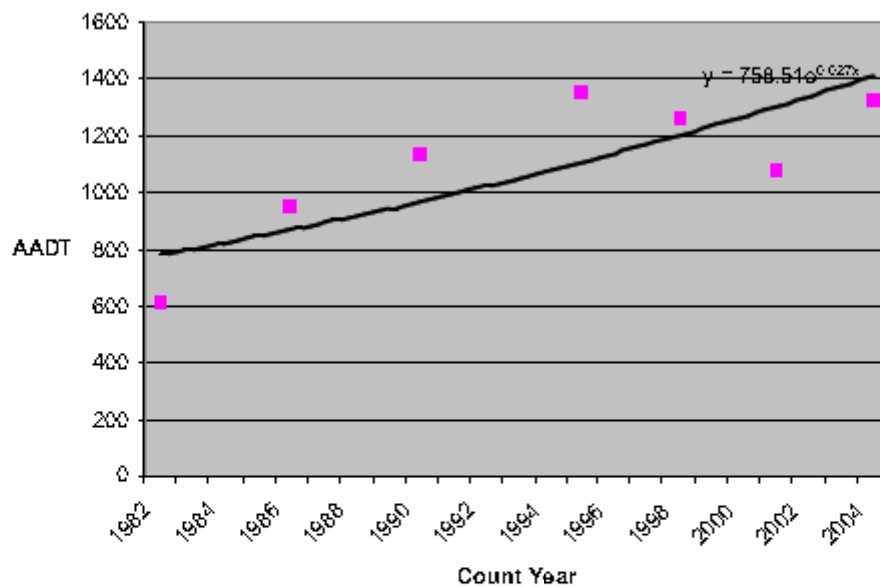
^{*} assumed growth rate

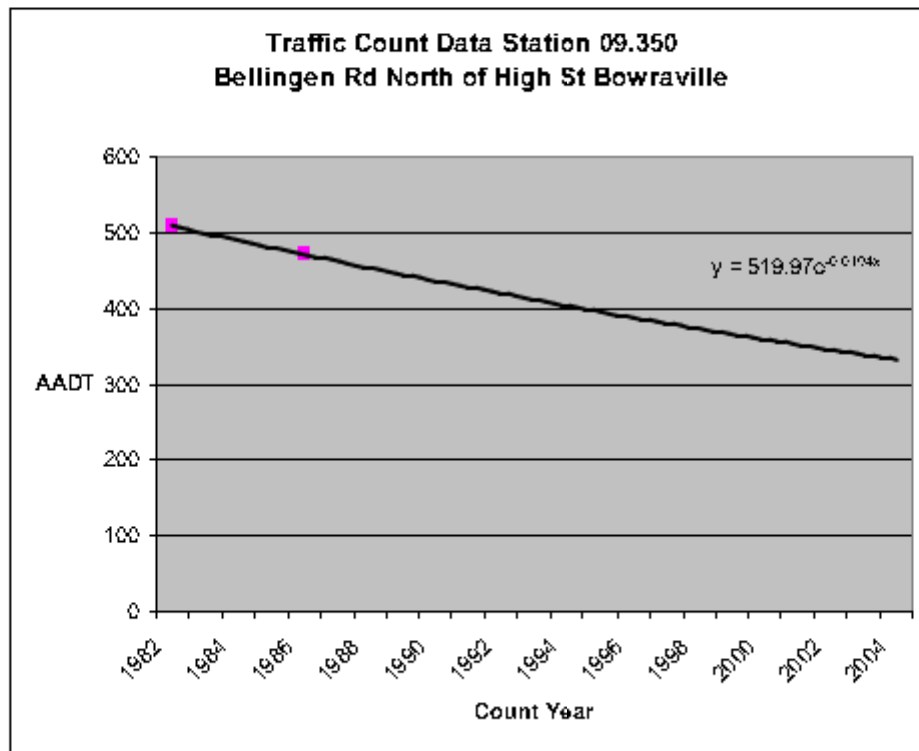


Traffic Count Data Station 09.347
Rodeo Dr Macksville



Traffic Count Data Station 09.349
Bellinghen Rd South Of High St Bowraville







Appendix C

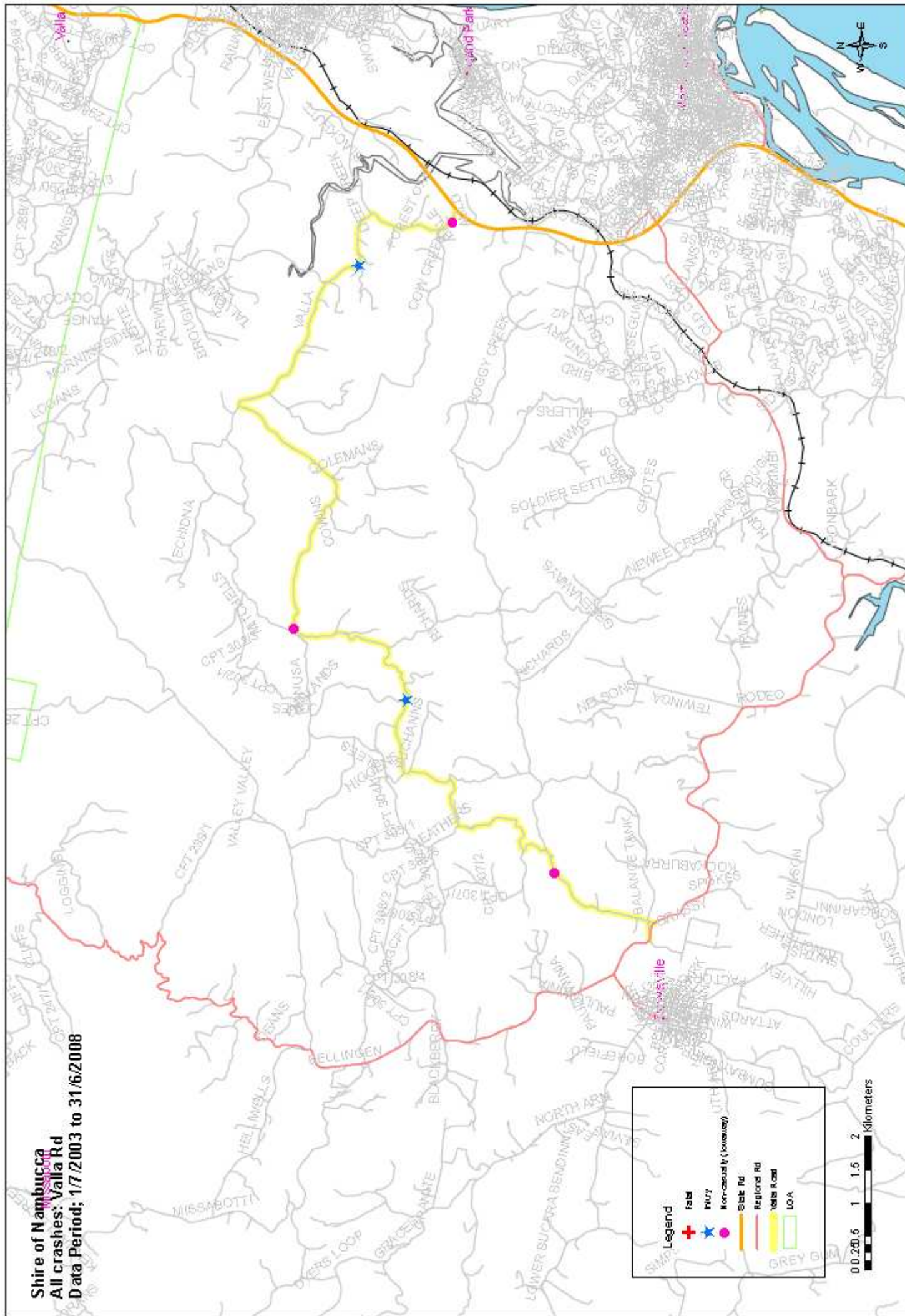
Traffic Crash Data

Valla Road
Rodeo Drive (MR 118)
Pacific Highway (SH 10)

Valla Road

- ▶ Location Map
- ▶ Summary Crash Report
- ▶ Brief Crash Report

Shire of Nambucca
 All crashes: Valla Rd
 Data Period: 1/7/2003 to 31/6/2008



Summary Crash Report

# Crash Type		Contributing Factors			Crash Movement		CRASHES		CASUALTIES	
Car Crash	4	80.0%	Speeding	3	60.0%	Intersection, adjacent approaches	Fatal crash	5	Killed	3
Light Truck Crash	1	20.0%	Fatigue	3	60.0%	Head-on (not overtaking)	Injury crash	2	Injured	3
Rigid Truck Crash	0	0.0%	Alcohol	2	40.0%	Opposing vehicles, turning	Non-casualty crash	3	Unrestrained	0
Articulated Truck Crash	0	0.0%				U-turn	* Be if fitted with not worn, No restraints fitted to position OR No restraints			
Heavy Truck Crash	0	0.0%	Weather			Rear-end	Time Group	% of Day	Crashes	Casualties
Bus Crash	0	0.0%	Fine	4	80.0%	Lane change	00:01 - 02:59	1	20.0%	0
Heavy Vehicle Crash	0	0.0%	Rain	1	20.0%	Parallel lanes, turning	03:00 - 04:59	0	0.0%	0
Emergency Vehicle Crash	0	0.0%	Overcast	0	0.0%	Vehicle leaving driveway	05:00 - 06:59	0	0.0%	3
Motorcycle Crash	1	20.0%	Fog or mist	0	0.0%	Overtaking, same direction	06:00 - 07:59	0	0.0%	0
Pedal Cycle Crash	0	0.0%	Other	0	0.0%	Hit parked vehicle	07:00 - 08:59	0	0.0%	0
Pedestrian Crash	0	0.0%	Road Surface Condition			Hit railway train	08:00 - 09:59	0	0.0%	0
* Rigid or Artic. Trucks "Heavy Truck or Heavy Bus"		Wet		1	20.0%	Hit pedestrian	09:00 - 10:59	1	20.0%	0
# These categories are NOT mutually exclusive		Dry		4	80.0%	Permanent obstruction on road	10:00 - 11:59	0	0.0%	0
* Up to 10 metres from an intersection		Snow or ice		0	0.0%	Hit animal	11:00 - 12:59	0	0.0%	0
-- 07:30-08:30 or 14:30-17:00 on non-holiday days		Natural Lighting				Off road, on straight	12:00 - 13:59	0	0.0%	0
Location Type		Dawn		0	0.0%	Off road on straight, hit object	13:00 - 14:59	0	0.0%	0
Collision Type		Daylight		2	40.0%	Out of control on straight	14:00 - 15:59	0	0.0%	0
Single Vehicle		Dusk		0	0.0%	Off road, on curve	15:00 - 16:59	1	20.0%	0
Multi Vehicle		Darkness		3	60.0%	Off road on curve, hit object	16:00 - 17:59	0	0.0%	0
Road Classification		Speed Limit				Out of control on curve	17:00 - 18:59	0	0.0%	0
Freeway/Motorway	0	0.0%	40 kmh or less	0	0.0%	Other crash type	18:00 - 19:59	1	20.0%	0
State Highway	0	0.0%	50 kmh zone	0	0.0%	~ 40kmh or less		0	0.0%	0
Other Classified Road	0	0.0%	60 kmh zone	1	20.0%	80 kmh zone	2	40.0%		
Unclassified Road	5	100.0%	70 kmh zone	0	0.0%	90 kmh zone	0	0.0%		
Day of the Week		# Holiday Periods				100 kmh zone	2	40.0%		
Monday	0	0.0%	0	0.0%	0	110 kmh zone	0	0.0%		
Tuesday	1	20.0%	1	20.0%	2	New Year		0	0.0%	0
Wednesday	0	0.0%	1	20.0%	3	Aust. Day	0	0.0%	0	0.0%
Thursday	0	0.0%	Sunday	2	40.0%	Easter	0	0.0%	0	0.0%
Friday	0	0.0%	WEEKEND	2	40.0%	Anzac Day	0	0.0%	0	0.0%
Saturday	0	0.0%	WEEKEND	3	60.0%	Queen's BD		0	0.0%	0
Sunday	0	0.0%				Labour Day	0	0.0%	0	0.0%
McLean Periods		Street Lighting Off/Nil				Christmas	0	0.0%	0	0.0%
A	0	0.0%	0	0.0%	0	January SH	0	0.0%	0	0.0%
B	0	0.0%	1	20.0%	2					
C	1	20.0%	1	20.0%	3					
D	0	0.0%	1	20.0%	3					
E	0	0.0%	1	20.0%	3					
F	0	0.0%	1	20.0%	3					
G	0	0.0%	1	20.0%	3					
H	2	40.0%	1	20.0%	3					
I	1	20.0%	1	20.0%	3					
J	1	20.0%	1	20.0%	3					

Crashki dataset Valla Road Crash data 1/7/2003 to 30/6/2008

Note: Data for the 3 month period prior to the generated date of this report are incomplete and are subject to change.

Percentages are percentages of all crashes. Unknown values for each category are not shown on this report.

Brief Crash Report

Crash No	Date	Day	Time	Dist	ID	Feature	Loc	Alg	Lgt	Wth	Sfc	SL	DCA	Tus	TU1	S1	D	Manoeuvre1	TU2	S2	D	Manoeuvre2	K	I	Fac	
Northern Region																										
Hamburca LGA																										
Bowraville																										
Valla Rd																										
54176	12/06/2006	Sat	07:30	2 km	N	RODEO DR	2km	CRV	N	Fne	Dry	60	60	L	CAR	S	Proceeding	lane						0	0	S F
Valla																										
Deep Creek Rd																										
55517	06/02/2007	Tue	22:15	200 m	W	PACIFIC HWY	2km	CRV	N	Fne	Dry	100	603	R	CAR	W	Proceeding	lane						0	0	S A
Valla Rd																										
406762	05/12/2003	Fri	10:37	46 m	E	MITCHELLS RD	2km	CRV	N	Rain	Wet	60	20	2	TRK	E	Inverted	side	TRK	W	Proceeding	lane		0	0	
516365	06/10/2005	Sun	16:30	1 km	W	NEWEE CREEK RD	2km	STR	Off	Fne	Dry	100	20	2	M/C	E	Inverted	side	CAR	W	Proceeding	lane		0	0	F
463444	26/05/2005	Sun	19:15	2.4 km	W	PACIFIC HWY	2km	CRV	N	Fne	Dry	60	603	L	CAR	W	Proceeding	lane						0	2	S F A

Report Totals: Crashes: 5 Fatal Crashes: 0 Injury Crashes: 2 Non-Casualty Crashes: 3 Traffic Units: 7 Killed: 0 Injured: 3

CrashId dataset Valla Road Crash data 1/7/2003 to 30/6/2008

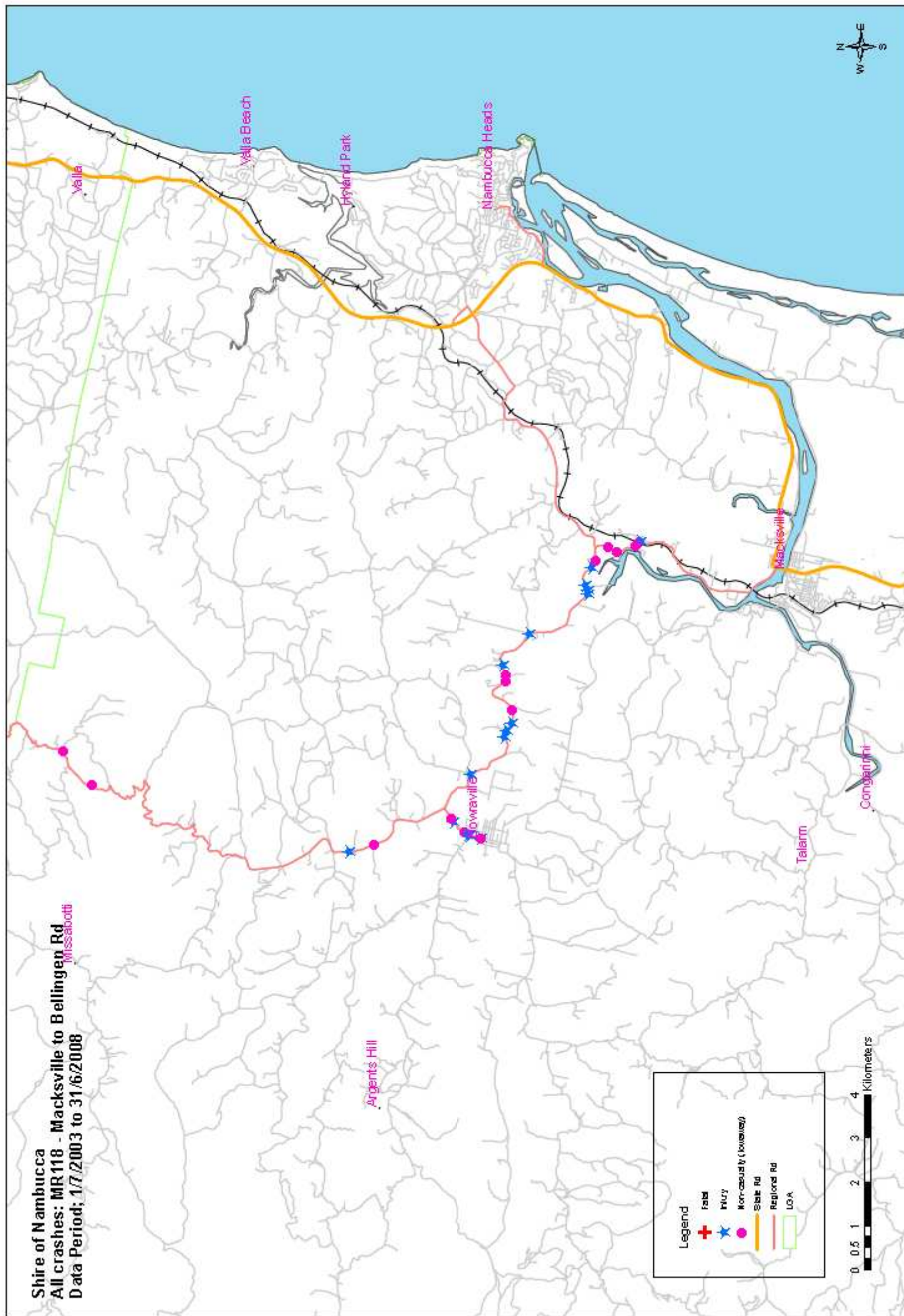
Note: Data for the 3 month period prior to the generated date of this report are incomplete and are subject to change.



Rodeo Drive (MR 118)

- ▶ Location Map
- ▶ Summary Crash Report
- ▶ Brief Crash Report

Shire of Nambucca
All crashes: MR118 - Macksville to Bellingen Rd
Data Period: 1/7/2003 to 31/6/2008



Summary Crash Report

# Crash Type		Contributing Factors			Crash Movement		CRASHES			CASUALTIES					
Car Crash	22	73.3%	Speeding	20	66.7%	Intersection, adjacent approaches	0	0.0%	Fatal crash	0	0.0%	Killed	0	0.0%	
Light Truck Crash	5	16.7%	Fatigue	5	16.7%	Head-on (not overtaking)	2	6.7%	Injury crash	16	53.3%	Injured	18	100.0%	
Rigid Truck Crash	0	0.0%	Alcohol	2	6.7%	Opposing vehicles, turning	1	3.3%	Non-casualty crash	14	46.7%	Unrestrained	1	5.6%	
Articulated Truck Crash	1	3.3%				U-turn	1	3.3%	^ Best fitted subject not worn, No restraint fitted to seat belt OR No restraint worn						
Heavy Truck Crash	(1)	(3.3%)	Weather			Rear-end	1	3.3%	Time Group	% of Day	Crashes	Casualties			
Bus Crash	0	0.0%	Fine	18	60.0%	Lane change	0	0.0%	00:01 - 02:59	0	0.0%	2	2008	0	
Heavy Vehicle Crash	(1)	(3.3%)	Rain	7	23.3%	Parallel lanes, turning	0	0.0%	03:00 - 04:59	2	6.7%	10	2007	4	
Emergency Vehicle Crash	0	0.0%	Overcast	5	16.7%	Vehicle leaving driveway	1	3.3%	05:00 - 06:59	0	0.0%	4	2006	3	
Motorcycle Crash	5	16.7%	Fog or mist	0	0.0%	Overtaking, same direction	0	0.0%	06:00 - 08:59	0	0.0%	7	2005	7	
Pedal Cycle Crash	0	0.0%	Other	0	0.0%	Hit parked vehicle	0	0.0%	07:00 - 07:59	2	6.7%	4	2004	2	
Pedestrian Crash	0	0.0%				Hit railway train	0	0.0%	08:00 - 08:59	1	3.3%	3	2003	2	
			Road Surface Condition			Hit pedestrian	0	0.0%	09:00 - 09:59	2	6.7%				
			Wet	13	43.3%	Permanent obstruction on road	1	3.3%	10:00 - 10:59	4	13.3%				
			Dry	17	56.7%	Hit animal	1	3.3%	11:00 - 11:59	2	6.7%				
			Snow or ice	0	0.0%	Off road, on straight	0	0.0%	12:00 - 12:59	0	0.0%				
						Off road on straight, hit object	2	6.7%	13:00 - 13:59	4	13.3%				
			Natural Lighting			Out of control on straight	0	0.0%	14:00 - 14:59	3	10.0%				
			Dawn	0	0.0%	Off road, on curve	5	16.7%	15:00 - 15:59	1	3.3%				
			Daylight	21	70.0%	Off road on curve, hit object	3	10.0%	16:00 - 16:59	3	10.0%				
			Dusk	2	6.7%	Out of control on curve	4	13.3%	17:00 - 17:59	0	0.0%				
			Darkness	7	23.3%	Other crash type	2	6.7%	18:00 - 18:59	1	3.3%				
			Speed Limit			~ 40kmh or less	0	0.0%	19:00 - 19:59	2	6.7%				
			40 kmh or less	0	0.0%	80 kmh zone	3	10.0%	20:00 - 21:59	1	3.3%				
			50 kmh zone	6	20.0%	90 kmh zone	0	0.0%	22:00 - 24:00	2	6.7%				
			60 kmh zone	1	3.3%	100 kmh zone	18	60.0%							
			70 kmh zone	2	6.7%	110 kmh zone	0	0.0%	Street Lighting Off/Nil	% of Dark					
									6	cf	7 in Dark	85.7%			
			Road Classification						McLean Periods	% Week					
			Freeway/Motorway	0	0.0%				A	4	13.3%	17.0%			
			State Highway	0	0.0%				B	1	3.3%	7.1%			
			Other Classified Road	24	80.0%				C	7	23.3%	17.0%			
			Unclassified Road	6	20.0%				D	5	16.7%	3.5%			
									E	3	10.0%	3.6%			
									F	3	10.0%	10.7%			
									G	3	10.0%	7.1%			
									H	1	3.3%	7.1%			
									I	1	3.3%	12.5%			
									J	2	6.7%	10.7%			
			Day of the Week			# Holiday Periods	New Year		Easter SH						
			Monday	5	16.7%	Thursday	Aust. Day	0	0.0%	Queen's BD	0	0.0%	Easter SH	0	0.0%
			Tuesday	3	10.0%	Friday	Easter	0	0.0%	Labour Day	0	0.0%	June/July SH	0	0.0%
			Wednesday	3	10.0%	Saturday	Anzac Day	0	0.0%	Christmas	0	0.0%	Sept./Oct SH	1	3.3%
										January SH	4	13.3%	December SH	1	3.3%

Crashkit dataset MR118 Crash data 1/7/2003 to 30/6/2008

Note: Data for the 3 month period prior to the generated date of this report are incomplete and are subject to change.

Percentages are percentages of all crashes. Unknown values for each category are not shown on this report.

Brief Crash Report

Crash No	Date	Day	Time	Dist	ID Feature	Loc	Alg	Lgt	Wth	Sfc	SL	DCA	Tus	TU1	S1 D	Manoeuvre1	TU2	S2 D	Manoeuvre2	K	I	Fac	
Northern Region																							
Narrabucca LGA																							
Bowraville																							
Bellinge Rd																							
466266	22/02/2005	Sat	03:00	6 km	N HALLWELLS RD	Zwiv	CRV	N	Fne	Dry	00	602	L	SEM	✓	S Proceeding				0	0	S	
Bellingen Rd																							
407724	17/02/2003	Fri	23:00	350 m	S BLACKBERRY LANE	Zwiv	CRV	N	Fne	Wet	00	603	L	M/C	✓	N Proceeding				0	✓	S A	
551704	27/07/2007	Sat	00:00	200 m	S TALLOWOOD SCHOOL	CT Zwiv	STR	N	Fne	Dry	00	207	2	W/C	✓	N Perform U-turn	W/C	✓	S Proceeding		0	0	
Belmore St																							
406657	27/2/2003	Sun	14:20		at HIGH ST	XJUN	STR	Off	Fne	Dry	50	407	2	CAR	2	N PJ ng out	CAR	2	N Proceeding		0	✓	
457659	10/2/2004	Wed	07:00		at HIGH ST	XJUN	STR	Off	Overcast	Wet	50	202	2	CAR	2	S Turning right	TRK	2	N Proceeding		0	0	
High St																							
463574	07/07/2005	Fri	00:00		at LOWER NORTH AR RD	XJUN	STR	Off	Fne	Dry	50	307	2	CAR	✓	S Proceeding	CAR	✓	S Proceeding		0	3	
397267	04/06/2003	Mon	06:00	00 m	N YOUNG ST	Zwiv	STR	Off	Fne	Dry	50	406	2	CAR	✓	E Reverse from drive	CAR	✓	N Proceeding		0	0	
536060	05/02/2006	Tue	16:30	50 m	S YOUNG ST	Zwiv	STR	Off	Fne	Dry	50	704	✓	CAR	✓	S Proceeding				0	✓	F	
Rodeo Dr																							
499567	26/02/2005	Sat	22:05	130 m	N COOK ST	Zwiv	STR	On	Fne	Dry	50	605	✓	CAR	✓	N Proceeding				0	✓	A	
620765	17/01/2006	Tue	11:20	650 m	E KOOKABURRA LANE	Zwiv	CRV	N	Rain	Wet	00	603	R	TRK	✓	W Proceeding				0	0	S	
597666	19/06/2007	Sun	13:50	350 m	S KOOKABURRA LANE	Zwiv	CRV	N	Rain	Wet	00	603	L	W/C	✓	N Proceeding				0	✓	S	
424370	05/01/2004	Mon	03:00	40 m	W KOOKABURRA LANE	Zwiv	CRV	N	Overcast	Wet	00	604	R	CAR	✓	W Proceeding				0	✓	F	
463797	19/02/2005	Sat	14:20	40 m	N LANES BDOE	Zwiv	STR	N	Fne	Dry	60	609	✓	TRK	✓	S Proceeding				0	0		
592667	11/06/2007	Tue	16:00	110 m	N RACECOURSE ENT	Zwiv	CRV	N	Fne	Dry	60	605	✓	M/C	✓	N Proceeding				0	✓	S	
Macksville																							
Rodeo Dr																							
552603	06/07/2007	Mon	06:00	370 m	E WIRRIWIRRI RD	Zwiv	CRV	N	Overcast	Wet	60	605	✓	CAR	✓	E Proceeding				0	0	S	
Missabotti																							
Bowraville Rd																							
576523	02/06/2007	Sat	11:30	3 km	S WILLIAMS RD	Zwiv	CRV	N	Fne	Dry	60	207	2	M/C	✓	S Inboard side	CAR	✓	N Proceeding		0	0	S
Tewings																							
Rodeo Dr																							
573772	05/03/2006	Sun	19:35	13 km	W TEWINGA LANE	Zwiv	CRV	N	Overcast	Wet	00	603	L	W/C	✓	W Proceeding				0	0	S F	
Rodeo Dr																							

Brief Crash Report

Crash No	Date	Day	Time	Dist	ID Feature	Loc	Alg	Lgt	Wth	Sfc	SL	DCA	Tus	TU1	S1	D	Manoeuvre1	TU2	S2	D	Manoeuvre2	K	I	Fac	
493376	27/06/2005	Wed	00:15		at KOOKABURRA LANE	TJUN	CRV	N	Fne	Dry	00	605		TRK		E	Proceeding lane					0		S	
503674	07/06/2005	Tue	06:30		at NUMBER 90 HIN	2wiv	STR	N	Fne	Dry	00	704		CAR		E	Proceeding lane					0			
525227	07/06/2006	Sat	00:30		at TEWING LANE	TJUN	CRV	N	Fne	Dry	00	605		M/C		W	Proceeding lane					0		S	
525607	05/05/2006	Mon	06:50	1.2-6.4	W WIRRIIMBI RD	2wiv	CRV	N	Ranng	Wet	00	603	L	CAR		W	Proceeding lane					0		S	
Wirrimbi																									
Rodeo Dr																									
559774	05/07/2007	Fri	06:25	37 m	E RAILWAY CROSS L	2wiv	CRV	N	Fne	Dry	00	207	2	M/C		W	Innovated side	TRK		E	Proceeding lane		0		S
Rodeo Dr																									
596629	07/07/2007	Tue	09:30	0.585 km	E KOOKABURRA LANE	2wiv	CRV	N	Ranng	Wet	00	603	L	CAR		W	Proceeding lane					0	0	S	
503060	07/06/2005	Sun	03:30	1.4 m	W NEWEE CREEK RD	2wiv	CRV	N	Fne	Dry	00	602	R	CAR		W	Proceeding lane					0		S F	
413677	23/07/2004	Fri	04:55	20 m	E RAILWAY OP	2wiv	CRV	N	Ranng	Wet	70	603	L	CAR		E	Proceeding lane					0	0	S	
558703	07/03/2007	Tue	03:20	530 m	S WIRRIIMBI RD	2wiv	CRV	N	Ranng	Wet	00	602	L	W/C		S	Proceeding lane					0	0	S	
625677	03/06/2006	Tue	05:00	1.4 m	S WIRRIIMBI RD	2wiv	CRV	N	Ranng	Wet	70	603	R	CAR		N	Proceeding lane					0	0	S	
577660	30/03/2007	Sat	03:55	320 m	W WIRRIIMBI RD	2wiv	CRV	N	Fne	Dry	00	602	R	VAN		E	Proceeding lane					0	0	S F	
441122	06/06/2004	Mon	07:50	500 m	W WIRRIIMBI RD	2wiv	CRV	N	Fne	Dry	00	602	L	CAR		E	Proceeding lane					0		S	
562730	26/02/2007	Wed	21:00	1.3 km	W WIRRIIMBI RD	2wiv	CRV	N	Overcast	Wet	00	502		CAR		E	PJ out of road					0		S	

Report Totals: Crashes: 30 Fatal Crashes: 0 Injury Crashes: 16 Non-Casualty Crashes: 14 Traffic Units: 37 Killed: 0 Injured: 18

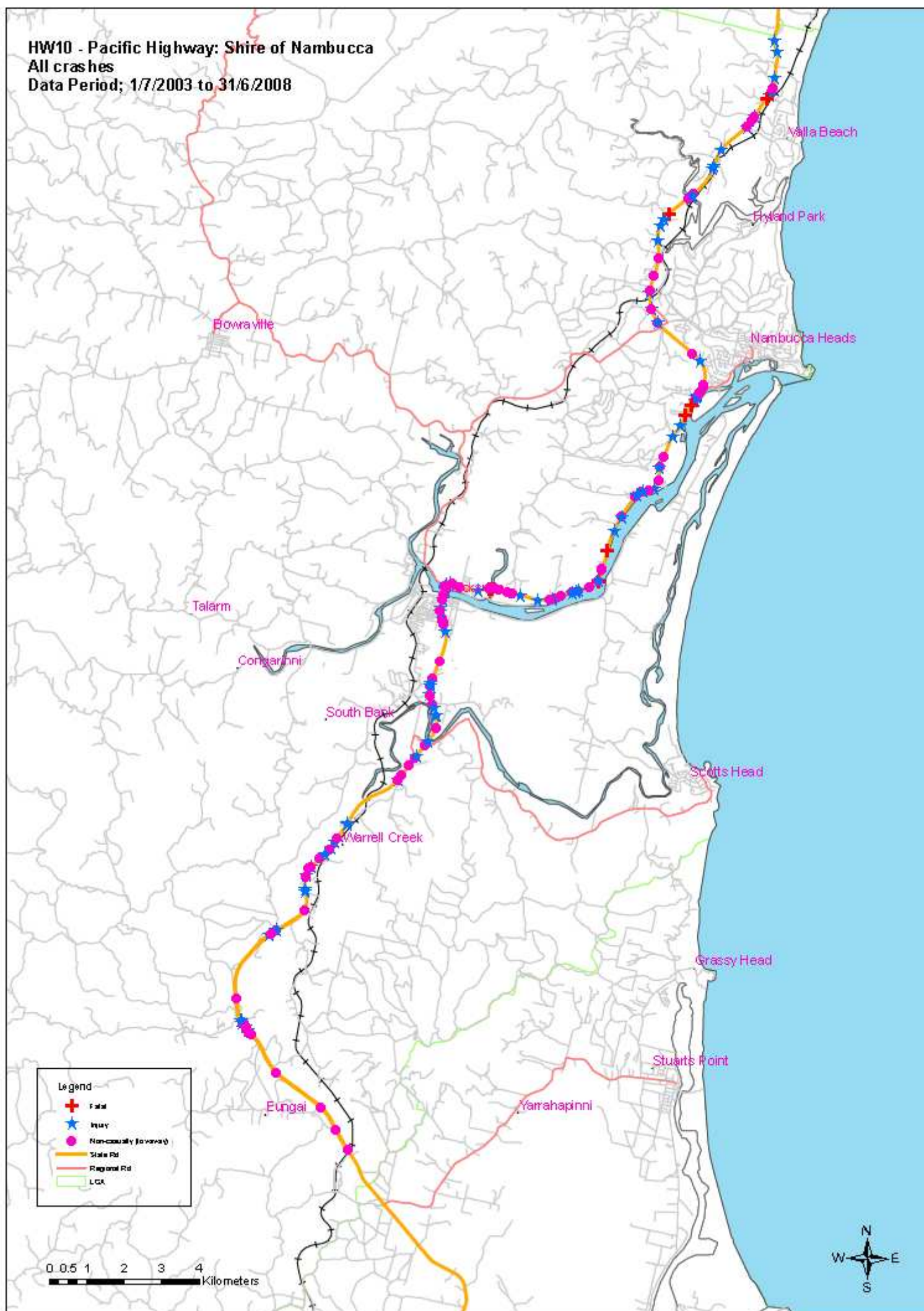
CrashId dataset MR118 Crash data 1/7/2003 to 30/6/2008

Note: Data for the 3 month period prior to the generated date of this report are incomplete and are subject to change.

Pacific Highway (SH 10)

- ▶ Location Map
- ▶ Summary Crash Report
- ▶ Brief Crash Report

HW10 - Pacific Highway: Shire of Nambucca
All crashes
Data Period: 1/7/2003 to 31/6/2008



CrashId dataset I1W10 - Pacific Highway Crash data 1/7/2003 to 30/6/2008

Note: Data for the 3 month period prior to the generated date of this report are incomplete and are subject to change.

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Brief Crash Report

Crash No	Date	Day	Time	Dist	ID	Feature	Loc	Alg	Lgt	Wth	Sfc	SL	DCA	Tus	TU1	S1	D	Manoeuvre1	TU2	S2	D	Manoeuvre2	K	I	Fac	
Northern Region																										
Nambucca LGA																										
Allongera																										
Pacific Hwy																										
416679	16/01/2004	Mon	19:50	200 m	N	ALLCOMERA CK	DIV	CRV	N	Rain	Wet	00	603	R	QMV		S	Proceeding					0		S	
563696	06/01/2007	Fri	06:09	150 m	S	ALLCOMERA CREEK RD	DIV	STR	Off	Fine	Dry	00	703		CAR		S	Proceeding					0		0	
541265	27/01/2006	Fri	21:30		at	ALLCOMERA RD	TJN	CRV	N	Overcast	Dry	00	306	2	CAR		S	Veering	TRK		S	Proceeding		0	0	
562361	16/03/2007	Sun	06:30	50 m	N	ALLCOMERA RD	DIV	CRV	N	Rain	Wet	00	601	R	CAR		S	Proceeding					0		S	
420692	23/03/2004	Tue	16:00	200 m	S	ALLCOMERA RD	DIV	STR	N	Rain	Wet	00	701		CAR		S	Proceeding					0		0	
460179	12/01/2005	Wed	13:15	250 m	S	ALLCOMERA RD	DIV	CRV	N	Fine	Dry	00	601	L	CAR		S	Proceeding					0		S	
Congarini																										
Pacific Hwy																										
475365	19/05/2005	Tue	02:20	500 m	S	COCKBURNS LANE	DIV	CRV	N	Fine	Dry	00	603	L	4WD		S	Proceeding					0		S F	
460567	16/01/2005	Sun	15:00		at	SCOTT'S HEAD RD	TJN	STR	N	Fine	Dry	00	101	2	UTE		E	Turning	CAR		N	Proceeding		0	2	
Donnellyville																										
Pacific Hwy																										
494717	06/01/2005	Sat	14:00		at	ALBERT DR	TJN	STR	Off	Fine	Dry	00	702		4WD		N	Proceeding					0			
630325	26/06/2006	Tue	11:40		at	ALBERT DR	TJN	STR	N	Fine	Dry	00	707	L	VAN		N	Turning					0		S	
596646	01/01/2007	Sun	02:00	100 m	N	CROUCHES CK	2wv	STR	N	Fine	Dry	00	703	2	WAC		S	Proceeding	SEM		S	Proceeding		0	A	
Eungai Creek																										
Pacific Hwy																										
541679	03/01/2006	Fri	17:16		at	ALLCOMERA CREEK RD	TJN	STR	N	Rain	Wet	00	703		UTE		S	Proceeding					0		0	
507445	27/01/2006	Fri	16:40		at	ALLCOMERA RD	TJN	STR	N	Fine	Dry	00	202	2	TRK		S	Turning	SEM		N	Proceeding		0		
419473	06/03/2004	Sat	06:26	60 m	N	ALLCOMERA RD	DIV	CRV	N	Rain	Wet	00	601	L	CAR		S	Proceeding					0		S	
472674	21/01/2005	Sun	00:40	700 m	N	ALLCOMERA RD	DIV	STR	N	Fine	Dry	00	701		CAR		N	Proceeding					0		0	
507165	19/01/2006	Tue	13:13	30 m	S	ALLCOMERA RD	DIV	CRV	N	Rain	Wet	00	601	L	CAR		S	Proceeding					0		S	
506417	16/02/2006	Tue	17:25	100 m	S	ALLCOMERA RD	DIV	CRV	N	Rain	Wet	00	601	L	CAR		S	Proceeding					0		S	
515270	23/02/2006	Tue	11:20	400 m	S	ALLCOMERA RD	DIV	STR	N	Rain	Wet	00	701		CAR		N	Proceeding					0		0	
527492	12/05/2006	Fri	13:05	200 m	N	BROWNS CROSSIN RD	DIV	STR	N	Fine	Dry	00	701		TRK		N	Proceeding					0		F	
557202	01/01/2007	Mon	16:30	200 m	N	EUNGAI CREEK BDC E	DIV	STR	N	Rain	Wet	00	703		CAR		S	Proceeding					0		0	
412635	06/01/2004	Fri	01:15	50 m	S	EUNGAI CREEK RD	DIV	STR	N	Fine	Dry	00	705		LOR		N	Proceeding					0		0	
474560	12/05/2005	Tue	01:27	62 m	S	PADDY'S REST AR TO	DIV	CRV	N	Overcast	Dry	00	603	L	SEM		N	Proceeding					0		S F	
466221	12/01/2004	Sun	06:15	200 m	S	UPPER WARRELL RD	DIV	STR	N	Fine	Dry	00	607		P/C		N	Proceeding					0			

Brief Crash Report

Crash No	Date	Day	Time	Dist	ID Feature	Loc	Alg	Lgt	Wth	Sfc	SL	DCA	Tus	TU1	S1 D	Manoeuvre1	TU2	S2 D	Manoeuvre2	K	I	Fac	
Eungai Rail																							
Pacific Hwy																							
Macksville																							
537230	16/06/2007	Sun	07:30	150 m	N STATION ST	DIV	STR	Off	Fne	Dry	000	703		DBDL		S	Proceeding				0	0	
Pacific Hwy																							
416102	17/06/2004	Mon	06:30		at BALD HILL RD	TJN	CRV	N	Fne	Dry	000	04	2	CAR	2	W/ Turning	CAR		S	Proceeding	0		
473746	04/05/2005	Wed	06:20	50 m	S BALD HILL RD	Zwiv	CRV	N	Rang	Wet	000	30	3	CAR		N	Proceeding	CAR		N	Stationary	0	0
447046	05/06/2004	Tue	22:15	300 m	S BALD HILL RD	Zwiv	STR	N	Fne	Dry	000	703		TRK		N	Proceeding				0	0	
498837	14/03/2005	Mon	04:30	400 m	S BALD HILL RD	Zwiv	CRV	N	Rang	Wet	000	602	R	TRK		N	Proceeding				0	0	
436556	10/07/2004	Sat	10:30	600 m	S BALD HILL RD	Zwiv	CRV	N	Overcast	Wet	000	305	3	CAR		S	Proceeding	W/AC		S	Proceeding	0	
525962	26/06/2006	Wed	11:00	600 m	S BALD HILL RD	Zwiv	STR	N	Fne	Dry	000	703		4W/D		S	Proceeding				0	F	
626762	22/05/2006	Tue	15:15		at BELLEVUE DR	TJN	STR	Off	Overcast	Wet	50	20	2	CAR		W/	Proceeding	SEM		E	Proceeding	0	0
516169	07/06/2006	Sun	15:00	200 m	S BOUNDARY RD	Zwiv	CRV	N	Fne	Dry	000	605		M/C		S	Proceeding				0	S	
490266	20/06/2005	Sat	06:25		at BOUNDARY ST	XJN	STR	Off	Fne	Dry	50	00	2	CAR	2	W/	Proceeding	CAR		N	Proceeding	0	0
576353	20/02/2007	Tue	06:10	40 m	N BOUNDARY ST	Zwiv	STR	N	Fne	Dry	50	60	2	W/AC		N	Proceeding	TRK		N	Parved	0	0
413055	15/07/2004	Tue	13:00	60 m	N BOUNDARY ST	Zwiv	STR	Off	Rang	Wet	60	703	2	CAR		N	Proceeding	CAR		N	Parved	0	0
603675	03/07/2007	Tue	16:10	5 m	S CALTEX SERVICE ENT	DIV	CRV	N	Fne	Dry	50	30	2	CAR		N	Proceeding	CAR		N	Stationary	0	
412602	10/07/2004	Sat	20:35	14 m	N CHAMPIONS LANE	Zwiv	CRV	N	Rang	Wet	000	602	L	CAR		N	Proceeding				0	S	
473626	07/05/2005	Sat	22:15	50 m	S CHAMPIONS LANE	Zwiv	CRV	N	Rang	Wet	000	605		M/C		N	Proceeding				0	S	
525960	11/06/2006	Sun	22:40	30 m	W/ CHAMPIONS LANE	Zwiv	CRV	N	Fne	Dry	50	603	L	DBDL		W/	Proceeding				0	0	
366193	16/06/2003	Tue	19:00	500 m	N CHAMPIONS WAY	Zwiv	STR	N	Fne	Dry	000	703		CAR		S	Proceeding				0	0	
411164	25/07/2004	Sun	15:19	20 m	N CHAPIONS LANE	Zwiv	CRV	N	Rang	Wet	000	602	L	CAR		N	Proceeding				0	S	
366274	06/06/2003	Sat	15:20		at FERRY ST	TJN	STR	Off	Fne	Dry	60	303	2	CAR		S	Proceeding	VAN		S	W/ Turning	0	2
523655	26/04/2006	Wed	04:45	40 m	N FERRY ST	Zwiv	CRV	On	Fne	Dry	50	603	L	DBDL		N	Proceeding				0	S	
513226	10/03/2006	Fri	11:55	10 m	S FERRY ST	TJN	STR	Off	Fne	Dry	50	30	3	TRK		S	Proceeding	TRK		S	Stationary	0	0
526622	12/06/2006	Mon	16:00	100 m	S FERRY ST	Zwiv	STR	Off	Fne	Dry	60	30	3	CAR		S	Proceeding	CAR		S	Proceeding	0	
596007	06/11/2007	Fri	11:50	50 m	S FLORENCE WILLMO DR	Zwiv	STR	N	Overcast	Wet	60	70		CAR		S	Proceeding				0		
604612	27/12/2007	Fri	06:30	200 m	E GRANDVIEW DR	Zwiv	CRV	N	Fne	Dry	000	603	R	VAN		W/	Proceeding				0	S	
426677	26/05/2004	Fri	00:45	40 m	S JERRY ST	Zwiv	STR	On	Fne	Dry	60	703		DBDL		S	Proceeding				0	0	
624406	17/05/2006	Sat	16:04	200 m	S LUMSDEN LANE	Zwiv	STR	N	Fne	Dry	000	50	2	M/C		S	Proceeding	VAN		N	Proceeding	0	
526023	27/06/2006	Tue	04:40	760 m	S LUMSDEN LANE	Zwiv	STR	N	Fne	Dry	000	20	3	4W/D		S	Proceeding	UTE		N	Proceeding	2	0
626674	26/06/2006	Tue	19:30	13 m	S LUMSDEN LANE	Zwiv	CRV	N	Fne	Dry	000	30	2	DBDL		S	Proceeding	CAR		S	Veering off	0	0

Brief Crash Report

Crash No	Date	Day	Time	Dist	ID Feature	Loc	Alg	Lgt	Wth	Sfc	SL	DCA	Tus	TU1	S1 D	Manoeuvre1	TU2	S2 D	Manoeuvre2	K	I	Fac
430060	06/07/2004	Tue	03:30	250 m	N LUMSDENS LANE	2wiv	STR	N	Fne	Dry	00	703		DBDL		N Proceeding lane				0	0	F
610060	17/03/2006	Mon	06:45	125 km	S LUMSDENS LANE	DIV	CRV	N	Rang	Wet	00	804	L	CAR		S Proceeding lane				0	0	F
412280	15/01/2003	Wed	16:45	16 km	S LUMSDENS LANE	2wiv	CRV	N	Fne	Dry	00	201	4	CAR		N Inboard side	SEM		S Proceeding lane	2		A
479416	23/06/2005	Tue	01:10	200 m	N MACKSVILLE BDCE	2wiv	CRV	On	Fne	Dry	50	803	L	SEM		N Proceeding lane				0		S
545006	17/01/2006	Tue	01:30	3.7 km	E MACKSVILLE TN	DIV	CRV	On	Rang	Wet	00	803	L	CAR		S Proceeding lane				0		S
451507	04/12/2004	Sat	23:20		at NAMRUCCA RIVER BDCE	2wiv	STR	On	Fne	Dry	00	703		DBDL		S Proceeding lane				0		F
450559	27/06/2005	Sat	04:14	55 m	E NEWEE CREEK BDCE	2wiv	STR	N	Fne	Dry	00	704		W/C		W Proceeding lane					0	F A
618110	31/03/2006	Mon	16:30	150 m	E NEWEE CREEK BDCE	2wiv	CRV	N	Overcast	Dry	00	804	R	CAR		W Proceeding lane				0	0	S F
412836	06/07/2004	Fri	15:40	400 m	E NEWEE CREEK BDCE	2wiv	STR	N	Fne	Dry	00	301	2	CAR		W Proceeding lane	W/C		W Proceeding lane	0	0	
606566	04/07/2006	Fri	12:20	60 m	W NEWEE CREEK BDCE	2wiv	CRV	N	Rang	Wet	70	301	3	SEM		E Proceeding lane	SEM		E Proceeding lane	0	0	
368005	04/07/2003	Fri	11:30		at NUMBER 33 HN	2wiv	STR	Off	Fne	Dry	50	301	2	CAR		N Proceeding lane	TRK		N Stationary	0	0	
541477	01/10/2006	Sun	13:15		at NURSERY RD	TJUN	STR	Off	Fne	Dry	00	102	2	CAR	2	N Turning right	TRK		E Proceeding lane	0	0	
626267	25/05/2006	Sun	14:15	500 m	E NURSERY RD	2wiv	STR	N	Fne	Dry	00	304	2	CAR		W Perform U-turn	CAR		W Proceeding lane	0	0	
461040	16/07/2005	Sun	15:10	800 m	N NURSERY RD	2wiv	STR	N	Fne	Dry	00	2	2	CAR		S Proceeding lane	PED		W Via across car gateway	0		
555710	25/02/2007	Sun	17:07	150 m	W NURSERY RD	2wiv	STR	Off	Rang	Wet	70	201	2	W/C		E Inboard side	DBDL		W Proceeding lane		0	F
626652	26/06/2006	Sat	16:40	150 m	W NURSERY RD	2wiv	CRV	N	Fne	Dry	00	805		CAR		E Veering left				0		S
436232	26/07/2004	Wed	19:23	200 m	E OLD COAST RD	2wiv	STR	N	Fne	Dry	00	702		P/C		E Proceeding lane				0		
619660	04/04/2006	Fri	13:30	173 km	E OLD COAST RD	2wiv	STR	N	Fne	Dry	00	502		M/C		W PU out of road				0		
530516	30/07/2006	Sun	06:00	20 m	S OLD COAST RD	2wiv	STR	N	Fne	Dry	00	703		CAR		S Proceeding lane				0		F
491927	27/06/2005	Sat	22:44	50 m	W OLD COAST RD	2wiv	STR	N	Fne	Dry	00	702		UTE		W Proceeding lane				0		
501769	07/12/2005	Wed	21:05	200 m	E OXLEY ST	2wiv	STR	N	Fne	Dry	50	301	2	TRK		W Proceeding lane	OMV		W Stationary	0	0	
368660	12/07/2003	Sat	11:00	100 m	S PARTRIDGE ST	2wiv	STR	Off	Fne	Dry	60	306	2	OMV		S Veering right	W/C		S Proceeding lane	0		
606629	13/12/2007	Tue	07:30	165 m	S PARTRIDGE ST	DIV	CRV	N	Fne	Dry	50	406	2	TRK		E Forward from drive	TRK		N Proceeding lane	0	0	
369367	26/06/2003	Tue	22:30	30 m	N RIVER ST	2wiv	STR	On	Fne	Dry	60	703		UTE		N Proceeding lane				0	0	A
621334	13/05/2006	Tue	23:50	30 m	N RIVER ST	2wiv	STR	On	Fne	Dry	50	301	3	SEM		S Proceeding lane	SEM		S Proceeding lane	0	0	
606419	06/07/2006	Tue	11:50	50 m	N RIVER ST	2wiv	STR	N	Overcast	Dry	50	301	2	W/C		S Proceeding lane	TRK		S Proceeding lane	0	0	
426468	20/05/2004	Tue	06:05	200 m	N RIVER ST	2wiv	STR	N	Fne	Dry	60	301	4	CCH		S Proceeding lane	CAR		S Stationary	0	2	
566666	22/04/2007	Sun	13:00	10 m	N RODEO DR	TJUN	CRV	Off	Fne	Dry	50	301	3	W/C		S Proceeding lane	CAR		S Stationary	0	0	
457190	26/12/2004	Sun	22:05	20 m	N RODEO DR	2wiv	CRV	On	Overcast	Dry	50	804	L	CAR		S Proceeding lane				0		S
496655	19/11/2005	Sat	15:33	20 m	S RODEO DR	2wiv	CRV	N	Fne	Dry	50	804	L	CAR		S Proceeding lane				0		S F
436560	11/07/2004	Sun	21:30		at SCOTT'S HEAD RD	TJUN	STR	On	Rang	Wet	00	104	2	CAR	2	E Turning right	CAR		N Proceeding lane	0	0	
610267	04/07/2006	Fri	16:45	500 m	N SCOTT'S HEAD RD	2wiv	STR	N	Rang	Wet	00	301	5	CAR		N Proceeding lane	CAR		N Stationary	0	2	

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Crash No	Date	Day	Time	Dist	ID Feature	Loc	Alg	Lgt	Wth	Sfc	SL	DCA	Tus	TU1	S1	D	Manoeuvre1	TU2	S2	D	Manoeuvre2	K	I	Fac
605096	01/07/2006	Fri	16:00	500 m	N SCOTT'S HEAD RO-OP	2wiv	CRV	N	Rang	Wet	00	603	R	CAR	CAR	S	Veering right					0	0	
507617	26/07/2005	Wed	23:59	70 m	S SCOTT'S HEAD RO-OP	2wiv	STR	On	Fne	Dry	00	702		CAR	CAR	S	Proceeding lane					0	0	F
364237	26/06/2003	Fri	13:05		at UPPER WARRRELL RD	TJN	CRV	N	Fne	Dry	00	002	2	CAR	2	E	Turning right	TRK		S	Proceeding lane	0	2	
430666	06/06/2004	Wed	06:50		at UPPER WARRRELL RD	TJN	STR	Off	Fne	Dry	00	004	2	CAR	2	E	Turning right	CAR		N	Proceeding lane	0	0	
460377	12/07/2005	Wed	14:15		at UPPER WARRRELL RD	TJN	CRV	N	Fne	Dry	00	202	2	CAR	CAR	S	Turning right	TRK		N	Proceeding lane	0	2	
576637	07/06/2007	Fri	12:25		at UPPER WARRRELL RD	TJN	STR	N	Fne	Dry	00	306	2	4wiv	CAR	S	Turning right	CAR		S	Turning right	0	3	
432675	25/05/2004	Tue	03:50	70 m	N UPPER WARRRELL RD	2wiv	CRV	N	Rang	Wet	00	607	L	SEM	SEM	N	Proceeding lane					0	0	S
566650	04/06/2007	Tue	06:26		at USHERS FRUIT S OT	2wiv	STR	N	Overcast	Dry	00	207	2	CAR	CAR	W	Perform U-turn	CAR		E	Proceeding lane	0	0	
507350	25/07/2006	Wed	11:10	20 m	W USHERS FRUIT OT	2wiv	STR	N	Overcast	Wet	00	307	3	LOR	CAR	E	Proceeding lane	4wiv		E	Proceeding lane	0	0	
516602	22/07/2006	Wed	11:35		at WALLACE ST	TJN	STR	N	Fne	Dry	50	703		CAR	CAR	S	Veering left					0	0	F
567662	24/06/2007	Fri	15:45		at WALLACE ST	TJN	STR	On	Overcast	Wet	60	306	2	UTE	2	E	Turning left	LOR	2	E	Turning left	0	0	
456667	16/07/2004	Tue	14:30	50 m	N WARRRELL CREEK BO-C	2wiv	CRV	N	Fne	Dry	00	603	R	4wiv	CAR	S	Proceeding lane					0	0	S
467700	22/07/2005	Sat	13:10	500 m	S WATT CK	2wiv	STR	N	Rang	Wet	00	307	2	CAR	CAR	S	Proceeding lane	SEM		S	Stationary	0	3	
606656	23/07/2007	Sun	15:30	400 m	N WEDGEWOOD DR	2wiv	STR	N	Fne	Dry	00	704		CAR	CAR	N	Proceeding lane					0	0	
406665	27/07/2003	Sat	17:30		at WRIGHTS CNR	2wiv	CRV	N	Rang	Wet	00	603	R	CAR	CAR	S	Proceeding lane					0	0	S
Nambucca Heads																								
Bellwood Dr																								
366663	12/07/2003	Sat	16:50	10 m	W PACIFIC HWY	TJN	CRV	On	Fne	Dry	50	706	L	WAC	2	N	Turning left					0	0	S
Bellwood Rd																								
526167	13/07/2006	Tue	20:45	10 m	W PACIFIC HWY	TJN	STR	On	Fne	Dry	60	707	L	CAR	2	S	Turning right					0	0	S
Pacific Hwy																								
467661	07/02/2005	Tue	15:10		at BELLWOOD RD	TJN	STR	Off	Fne	Dry	60	202	2	WAC	CAR	S	Turning right	CAR		N	Proceeding lane	0	0	
563264	16/03/2007	Fri	06:23		at BELLWOOD RD	TJN	STR	N	Fne	Dry	60	004	2	CAR	2	E	Turning right	CAR		N	Proceeding lane	0	0	
402667	27/07/2003	Mon	15:25	20 m	N BELLWOOD RD	DIV	STR	N	Fne	Dry	60	307	2	SEM	SEM	N	Veering left	CAR		N	Proceeding lane	0	0	
536767	07/07/2006	Tue	16:05	50 m	N BELLWOOD RD	DIV	STR	Off	Fne	Dry	60	3	2	UTE	CAR	N	Proceeding lane	PED		W	Stop for red light	0	0	
404406	05/07/2003	Wed	22:46	50 m	S BELLWOOD RD	DIV	STR	On	Fne	Dry	60	305	2	SEM	SEM	S	Proceeding lane	VAN		S	Proceeding lane	0	0	
410276	11/06/2004	Wed	11:10	100 m	S BELLWOOD RD	2wiv	STR	N	Fne	Dry	60	304	2	CAR	CAR	S	Perform U-turn	CAR		S	Proceeding lane	0	0	
567706	25/07/2007	Sun	07:30	250 m	S BELLWOOD RD	2wiv	STR	N	Fne	Dry	60	703	2	CAR	CAR	S	Proceeding lane	SEM		S	Perched	0	0	F A
526666	04/05/2006	Tue	16:15	246 m	S BELLWOOD RD	2wiv	CRV	N	Fne	Dry	60	303	2	CAR	CAR	N	Proceeding lane	CAR		N	Turning right	0	0	
426553	30/04/2004	Fri	15:25	350 m	N BOCCY CREEK RD	2wiv	STR	N	Fne	Dry	00	603	2	CAR	CAR	N	Proceeding lane	4wiv		N	Broken down	0	3	
475900	05/02/2004	Tue	06:45	20 m	N DEEP CK	2wiv	STR	N	Fne	Dry	00	704		CAR	CAR	S	Proceeding lane					0	0	F
426733	26/04/2004	Tue	23:20	120 m	S FLORENCE WILLM DR	2wiv	CRV	N	Rang	Wet	60	603	R	UTE	CAR	S	Proceeding lane					0	0	S

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Crash No	Date	Day	Time	Dist	ID Feature	Loc	Alg	Lgt	Wth	Sfc	SL	DCA	Tus	TU1	S1 D	Manoeuvre1	TU2	S2 D	Manoeuvre2	K	I	Fac
54521	06/01/2006	Tu	16:35	100 m	N FLORENCE WILLMO DR	Zwiv	CRV	N	Rain	Wet	60	60	L	CAR	N	Proceeding	TRK	N	Proceeding	0	0	S
600675	05/02/2007	Wed	06:00	120 m	N FLORENCE WILLMO DR	Zwiv	STR	Off	Fne	Dry	60	304	2	CAR	N	Perform U-turn				0		
433416	27/06/2004	Su	05:43	300 m	N FLORENCE WILLMO DR	Zwiv	CRV	N	Fne	Dry	60	603	L	SEM	S	Proceeding				0	0	S F
545337	04/01/2006	Sat	22:40	500 m	S FOXS RD	Zwiv	STR	N	Rain	Wet	100	702		CAR	N	Proceeding				0	0	F
462513	06/02/2005	Tu	17:00	at	LINK RD	TJUN	STR	Off	Fne	Dry	100	706	R	M/C	S	Turning left				0		S A
466069	01/06/2005	Mon	06:30	at	LINK RD	TJUN	STR	Off	Fne	Dry	100	101	2	CAR	2	Proceeding	CAR	S	Proceeding	0	2	
579267	11/06/2007	Mon	12:00	at	LINK RD	TJUN	STR	Off	Fne	Dry	100	101	2	LTR	S	Proceeding	CAR	2	Stationary	0	0	
513360	17/03/2006	Fri	10:30	400 m	S LINK RD	Zwiv	STR	N	Fne	Dry	100	207	2	CAR	S	Perform U-turn	CAR	N	Proceeding	0	0	
446663	16/01/2004	Mon	23:52	300 m	N NAMBUCCA RESOR M	Zwiv	CRV	N	Rain	Wet	60	201	2	DBL	S	Inboard side	SEM	N	Proceeding	0		S
416720	05/03/2004	Fri	13:15	50 m	N NUMBER 3 HN	Zwiv	CRV	Off	Fne	Dry	60	201	2	4WD	S	Inboard side	TRK	N	Proceeding	0	2	F
507014	05/01/2006	Tu	16:20	500 m	N PIONEER ST	Zwiv	CRV	N	Rain	Wet	100	604	L	UTE	S	Proceeding	TRK	N	Proceeding	0	0	S
512219	23/01/2006	Mon	07:45	400 m	S PIONEER ST	Zwiv	STR	N	Fne	Dry	100	201	2	CAR	S	Inboard side	TRK	N	Proceeding	0	2	F
450366	26/01/2004	Tu	21:35	at	RIVERSIDE DR	TJUN	STR	On	Fne	Dry	60	706	R	CAR	2	Turning left				0	0	S A
500567	14/02/2005	Wed	06:00	at	RIVERSIDE DR	TJUN	STR	Off	Fne	Dry	60	105	2	CAR	N	Turning right	CAR	2	Turning right	0	0	
590632	04/06/2007	Tu	10:20	at	RIVERSIDE DR	TJUN	CRV	Off	Overcast	Dry	60	101	2	CAR	2	Proceeding	ATKR	S	Proceeding	0	0	
432756	24/06/2004	Tu	10:00	700 m	N RIVERSIDE DR	Zwiv	STR	N	Fne	Dry	100	703		TRK	S	Proceeding				0		F
512733	17/03/2006	Fri	03:00	1 km	N RIVERSIDE DR	Zwiv	STR	N	Fne	Dry	100	704		LOR	S	Proceeding				0	0	F
575666	23/05/2007	Wed	10:15	45 m	S RIVERSIDE DR	OTH	CRV	Off	Fne	Dry	60	301	2	CAR	S	Proceeding	CAR	S	Proceeding	0	0	
572127	13/04/2007	Fri	23:39	200 m	S RIVERSIDE DR	DIV	STR	On	Fne	Dry	60	703		CAR	N	Proceeding				0	0	F
422635	16/03/2004	Tu	06:15	1.6 km	S RIVERSIDE DR	Zwiv	STR	N	Fne	Dry	100	704		UTE	S	Proceeding				0		
463740	16/02/2005	Fri	16:20	at	RUTLAND ST	TJUN	STR	Off	Fne	Dry	60	303	3	CAR	S	Proceeding	WAC	S	Waiting	0	3	
466667	19/01/2005	Sat	10:00	at	RUTLAND ST	TJUN	STR	Off	Fne	Dry	60	303	2	SEM	S	Proceeding	WAC	S	Waiting	0		
400335	01/01/2003	Wed	22:15	1.25 km	S RUTLAND ST	Zwiv	CRV	N	Rain	Wet	60	602	L	CAR	S	Proceeding				0	0	S
424636	07/04/2004	Wed	14:30	1 km	S TEACUES CREEK BDC	Zwiv	CRV	N	Rain	Wet	60	301	2	LOR	N	Proceeding	CAR	N	Proceeding	0	0	
431002	06/06/2004	Wed	10:50	200 m	S VALLA RD	Zwiv	CRV	N	Fne	Dry	100	605		CAR	S	Proceeding				0	2	
470663	06/02/2005	Tu	11:15	at	WILLUNCA AVE	TJUN	STR	Off	Fne	Dry	60	104	2	CAR	2	Turning right	OMV	N	Proceeding	2		
Newee Creek																						
Pacific Hwy																						
464664	16/07/2005	Sat	03:10	1 km	N OLD COAST RD	Zwiv	CRV	N	Fne	Dry	100	201	2	CAR	S	Inboard side	SEM	N	Proceeding	0	2	
Oyster Creek																						
Pacific Hwy																						
466667	26/06/2005	Mon	13:30	120 m	S BURKES LANE	Zwiv	CRV	N	Overcast	Dry	100	201	2	CAR	S	Inboard side	WAC	N	Proceeding		2	

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Crash No	Date	Day	Time	Dist	ID Feature	Loc	Alg	Lgt	Wth	Sfc	SL	DCA	Tus	TU1	S1 D	Manoeuvre1	TU2	S2 D	Manoeuvre2	K	I	Fac		
Valla																								
Pacific Hwy																								
415/25	2/06/2004	Tue	11:20		at BURKE LANE	TJN	STR	N	Fne	Dry	000	703		SEM		S	Proceeding lane				0			
4060/9	20/2/2003	Sat	2:20	100 m	N BURKES LANE	2w/v	CRV	N	Fne	Dry	000	603	R	CAR		N	Proceeding lane				0			
59/7/7	7/06/2007	Mon	06:16	500 m	N BURKES LANE	2w/v	STR	N	Fne	Dry	000	207	2	CAR		N	Incorrect side	CAR	S	Incorrect side	0	3	F	
607679	06/02/2006	Fri	12:15	40 m	N DEEP CK	2w/v	STR	N	Fne	Dry	000	304	2	W/C		N	Perform U-turn	TRK	N	Proceeding lane	0			
4/2536	05/07/2004	Mon	06:15		at DEEP CREEK BDCE	2w/v	STR	N	Fne	Dry	000	703		CAR		S	Proceeding lane				0		F	
435/67	11/07/2004	Sun	16:21		at DEEP CREEK BDCE	2w/v	STR	N	Ranng	Wet	000	307	2	W/C		N	Proceeding lane	CAR	N	Proceeding lane	0	2		
5263/16	13/05/2006	Sat	22:10		at DEEP CREEK BDCE	2w/v	STR	N	Fne	Dry	000	703		W/C		N	Proceeding lane				0			
516566	22/2/2006	Wed	06:10		at DEEP CREEK BDCE	2w/v	STR	N	Fne	Dry	000	607		4w/D		S	Proceeding lane				0			
516600	22/2/2006	Wed	06:10		at DEEP CREEK BDCE	2w/v	STR	N	Fne	Dry	000	703		SEM		N	Proceeding lane				0		F	
466003	16/03/2005	Wed	13:30	100 m	N DEEP CREEK BDCE	2w/v	STR	N	Fne	Dry	000	705		TRK		S	Proceeding lane				0			
503065	13/2/2005	Sun	16:15	200 m	S DEEP CREEK RD	2w/v	CRV	N	Fne	Dry	000	602	L	CAR		N	Proceeding lane				0		S	
600056	2/2/2007	Wed	14:15	400 m	S DEEP CREEK RD	2w/v	CRV	N	Fne	Dry	000	603	R	CAR		N	Proceeding lane				0		S	
401/15	11/2/2003	Tue	05:15		at EAST WEST RD	TJN	STR	N	Fne	Dry	000	703		CAR		S	Proceeding lane	CAR	2	E	Proceeding lane	0		
565/14	10/06/2007	Fri	06:30		at EAST WEST RD	TJN	STR	N	Fne	Dry	000	104	2	4w/D		S	Turning right				0			
435959	03/06/2004	Tue	23:55	40 m	N EAST WEST RD	2w/v	STR	N	Fne	Dry	000	703		4w/D		N	Proceeding lane	W/C	N	Proceeding lane	0		F	
606795	10/07/2006	Tue	2:15	2 km	N EAST WEST RD	2w/v	STR	N	Fne	Dry	60	307	2	TRK		N	Proceeding lane	CAR	N	With turning	0			
417776	07/02/2004	Fri	06:15		at FOXS RD	TJN	STR	N	Overcast	Dry	000	303	2	CAR		N	Proceeding lane	SEM	N	Proceeding lane	0		F	
5/61/4	26/06/2005	Fri	06:10	1.9 km	S MCCORATHS CK	2w/v	STR	N	Fne	Dry	Unk	207	2	CAR		S	Incorrect side	CAR	N	Proceeding lane	0			
425664	23/01/2004	Fri	16:20	10 m	N NUMBER 25 HN	2w/v	CRV	N	Fne	Dry	000	307	2	M/C		N	Proceeding lane	CAR	N	Proceeding lane	0			
60/111	30/2/2007	Tue	06:00	10 km	S URUNCA TN	2w/v	CRV	N	Fne	Dry	000	602	R	4w/D		N	Proceeding lane	CAR	N	Proceeding lane	0		F	
4/1612	03/02/2004	Tue	14:35		at VALLA BEACH RD	TJN	STR	N	Fne	Dry	000	104	2	4w/D		W	Turning right	CAR	S	Proceeding lane	0			
554406	27/2/2007	Sat	16:15	20 m	N VALLA BEACH RD	2w/v	STR	Off	Overcast	Dry	000	703		CAR		N	Proceeding lane				0			
416276	06/2/2004	Fri	2:55	237 m	N VALLA BEACH RD	2w/v	STR	N	Fne	Dry	000	607		CAR		S	Proceeding lane				0			
400/42	26/06/2003	Tue	15:50		at VALLA RD	TJN	STR	N	Fne	Dry	000	104	2	CAR		2	E	Turning right	CAR	N	Proceeding lane	5		
566570	06/06/2007	Wed	16:15	1.7 km	N VALLA RD	2w/v	STR	N	Fne	Dry	000	500	2	CAR		N	PU out of road	BDBL	N	Proceeding lane	0	2		
Valla Beach																								
Pacific Hwy																								
4/2630	11/07/2004	Sun	15:00		at VALLA BEACH RD	TJN	STR	N	Ranng	Wet	000	104	2	CAR		2	W	Turning right	CAR	S	Proceeding lane	0		
Warrell Creek																								
Pacific Hwy																								

Brief Crash Report

Crash No	Date	Day	Time	Dist	ID Feature	Loc	Alg	Lgt	Wth	Sfc	SL	DCA	Tus	TU1	S1 D	Manoeuvre1	TU2	S2 D	Manoeuvre2	K	I	Fac
414652	26/07/2004	Tu	06:10	1.4m	N ALBERT DR	Zwiv	CRV	N	Fne	Dry	00	300	2	4WD	N	Proceeding lane	CAR	N	Proceeding lane	0	0	S
555595	06/06/2006	Mon	19:25	1.5m	S ALBERT DR	Zwiv	CRV	N	Rang	Wet	60	20	2	CAR	S	Improved side	SEM	N	Proceeding lane	0	0	S
51627	27/07/2005	Su	15:50	60m	at COCKBURNS LANE	TJN	STR	N	Overcast	Wet	60	703	3	TRK	N	Proceeding lane	CAR	N	Turning right	0	0	F
531672	05/06/2006	Sat	06:30	60m	N COCKBURNS LANE	Zwiv	STR	Off	Rang	Wet	60	703		WAC	S	Proceeding lane				0	0	
627504	15/05/2006	Tu	11:30	60m	N COCKBURNS LANE	Zwiv	STR	N	Fne	Dry	60	30	2	CAR	S	Proceeding lane	CAR	S	Stationary	0	2	S
463473	03/06/2005	Sat	21:40	730m	N COCKBURNS LANE	Zwiv	CRV	On	Rang	Wet	60	603	L	CAR	N	Proceeding lane				0	3	S
575237	27/04/2007	Fri	20:30	1.22m	N COCKBURNS LANE	Zwiv	CRV	N	Rang	Wet	60	605		SEM	S	Proceeding lane				0	0	S
416370	23/02/2004	Mon	01:30	10m	N FRUIT STALL OT	Zwiv	STR	N	Fne	Dry	60	202	2	WAC	S	Turning right	CAR	N	Proceeding lane	0	2	
60462	12/01/2007	Fri	01:30	10m	S MILL LANE	XJN	STR	N	Fne	Dry	00	703		SEM	S	Proceeding lane				0	0	
503624	26/07/2005	Sat	05:40	730m	S MILL LANE	Zwiv	CRV	N	Fne	Dry	60	604	L	WAC	N	Proceeding lane				0	0	S
460450	26/06/2005	Wed	16:45	600m	S MILL LANE	Zwiv	CRV	N	Rang	Wet	60	603	R	SEM	S	Proceeding lane				0	0	S
446036	17/07/2004	Su	15:50	1.4m	S MILL LANE	Zwiv	CRV	N	Rang	Wet	60	604	R	CAR	S	Proceeding lane				0	0	S F
473622	07/05/2005	Sat	04:00	1.4m	S MILL LANE	Zwiv	STR	N	Fne	Snow	60	703		WAC	N	Proceeding lane				0	0	F A
461313	26/07/2005	Wed	21:05	200m	S MILL RD	Zwiv	STR	N	Rang	Wet	60	703		CAR	N	Proceeding lane				0	4	S
622264	26/04/2006	Sat	01:00	260m	S SCOTT'S HEAD RD	DIV	STR	N	Fne	Dry	60	705		M/C	N	Proceeding lane				0	0	
561672	06/07/2007	Mon	16:20	50m	N SUTTONS FRUIT OT	Zwiv	STR	N	Rang	Wet	60	70		CAR	S	Proceeding lane				0	0	
522674	03/06/2006	Sat	06:30	5m	S UNNAMED RD	TJN	STR	N	Fne	Dry	60	706	L	CAR	S	Turning left				0	0	S
527222	06/06/2006	Tue	16:45	10m	N UPPER WARDLE RD	TJN	STR	N	Rang	Wet	00	703		CAR	N	Proceeding lane				0	0	
565075	11/06/2007	Sat	06:15	700m	N UPPER WARDLE CK	Zwiv	CRV	N	Fne	Dry	60	604	R	BDBL	S	Proceeding lane				0	0	S
436469	06/07/2004	Fri	14:10	60m	at UPPER WARDLE RD	XJN	STR	N	Fne	Dry	00	10	2	LOR	N	Proceeding lane	CAR	2	E Stationary	0	0	
530242	21/07/2006	Fri	19:20	150m	S UPPER WARDLE RD	DIV	STR	N	Rang	Wet	00	703		CAR	N	Proceeding lane				0	0	
414666	05/02/2004	Tu	17:55	200m	S UPPER WARDLE RD	DIV	STR	N	Fne	Dry	00	704		4WD	N	Proceeding lane				0	0	
399566	13/06/2003	Sat	12:15	500m	N WARDLE CREEK BDC	Zwiv	STR	N	Fne	Dry	60	303	2	4WD	S	Proceeding lane	CAR	S	Waiting	0	0	
Report Totals:																					Injured: 120	
										Non-Casualty Crashes: 33										Killed: 11		
										Traffic Units: 233												

Crashid dataset I1W10 - Pacific Highway Crash data 1/7/2003 to 30/6/2008

Note: Data for the 3 month period prior to the generated date of this report are incomplete and are subject to change.

Appendix D

Traffic Management Plan Framework



For the purpose of this outline it is assumed that the main access route to the storage site is via Valla Road. The following outline details a number of essential steps or considerations, which should be included in a Traffic Management Plan for access to the sites.

- ▶ Carry out detailed inspection of Valla Road with respect to width squeeze points and use by range of anticipated traffic. Develop appropriate traffic management procedures for construction practice;
- ▶ Assess site area and determine appropriate storage and manoeuvring areas for various phases of construction;
- ▶ Develop required traffic management procedures/plans for oversize loads from Macksville to site;
- ▶ Develop traffic management plans/traffic control plans with details of temporary speed zonings, traffic control devices and temporary fixed traffic signals etc for approval of the road authority;
- ▶ Consult with the Local Traffic Committee through NSC to determine class of traffic management plans and process for approval etc;
- ▶ Consider the placement of special advisory or variable message signs for the duration of the works;
- ▶ Apply to the RTA for any required approvals of Traffic Control Plans;
- ▶ Consultation and advice to affected landowners;
- ▶ Consultation and advice to Police and emergency services, bus companies and NSC;
- ▶ Develop maintenance plan for Valla Road and intervention reference points for grading, gravel re-sheeting, dust suppression etc in conjunction with NSC; and
- ▶ Consider installation of advisory curve warning signs for the construction period;

Appendix E

Advice from Department of Lands

GHD
PO Box 1340
COFFS HARBOUR NSW 2450

Crown Lands NSW
Level 1, 76 Victoria Street
PO Box 272
GRAFTON 2460

telephone (02) 6640 2055

facsimile (02) 6640 2036

e-mail Stephen.Houlahan@lands.nsw.gov.au

www.lands.nsw.gov.au

Your Ref: Chris Weaver
Our Ref: 09/02042

JOB No. 2214133			
ENTERED TO DATABASE			
INITIAL		DATE	
MKP		5/3/09	
DATE		REF. No.	
NAME	INIT	DATE	ACTION
PP	150	3/3	—
GW			
TR			
JM			
SL			

Monday, 2 March 2009

Dear Sir,

Proposed Crown land for Dam Construction

I refer to your recent correspondence exchange with Michele Hurcum from this office regarding proposed dam site at Valla by Nambucca Shire Council.

The best way to proceed with the above works is for Nambucca Shire Council (as eventual owners of the land) to apply to this office to obtain concurrence for acquisition of any Crown land that may be affected by river storage proposal. The letter should state;

- For what purpose Crown land/roads are required.
- What structures will be placed upon lands acquired.
- What if any environmental studies have been undertaken and copies of reports.

A clear and easy identifiable diagram should be included with acquisition request from Council highlighting all lands involved together with cheque/money order for \$487.70 to cover investigation fees.

If the acquisition of the Crown lands/roads is approved you will be notified. A plan of survey would then need to be lodged with this office for approval and then subsequently lodged with Land and Property Information office in Sydney. This office will also require payment of compensation for the acquisition of land in the amount assessed by a registered valuer as at the date of gazettal of the acquisition.

This is a brief outline of process involved with acquisitions Council will need to comply with its obligations in relation to land acquisitions under their relevant legislation in the first instance.

To avoid delays on all future correspondence please note the file reference: **09/02042**.

Yours sincerely



Narelle Hooton
For: Manager Land Administration
NORTH COAST



GHD

2/115 West High Street

Coffs Harbour NSW 2450

T: (02) 6650 6600 F: (02) 6652 6021 E: cfsmail@ghd.com.au

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This report has been prepared by GHD in response to a specific brief issued by NSC and the Proposal for services presented by GHD. This report is intended for the sole use of the client. It has been prepared in accordance with the Terms of Engagement for the commission and on the basis of specific instructions and information provided by the client. The contents and conclusion of this report cannot be relied upon by any third party.

This report should not be altered, amended or abbreviated, issued in part or issued incomplete in any way without prior checking and approval by GHD.

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	C Weavers	M Lyons	M Lyons	M Graver	M Graver	Feb 09



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